THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XXI. No. 503—24TH YEAR.] LONDON, JANUARY 16, 1872. [Subscription { 15s. in Advance. / 18s. Credit. } DOUBLE No. Price 1s.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.
RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.
RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.
Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

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IMPROVED DRY GAS-METERS.

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OR
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JOSEPH COWEN and CO.,
BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,
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J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
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COMBINING ALL THE LATEST IMPROVEMENTS,
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For Locomotive, Marine, and Stationary Boilers.
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GAS OVENS IN SEGMENTS OF EQUAL QUALITY.
A large Stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all Sizes kept in London at Mr. ALFRED WILLIAMS, Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.
N.B.—*Export orders continue to have prompt attention.*

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The only Prize Medal awarded for TUBES & FITTINGS.

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LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;
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THOMAS PIGGOTT & CO.,

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CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

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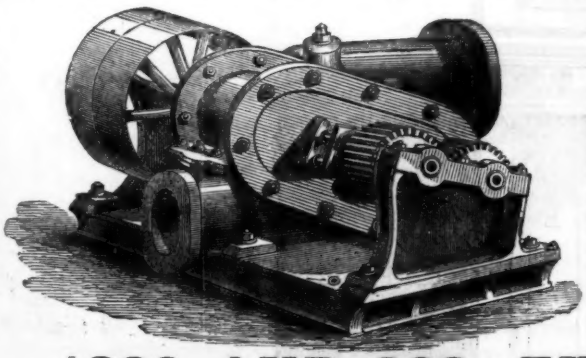

The very best Pump yet introduced for pumping in gas-works, tanneries, distilleries, breweries, water and sewage works, paper-mills, sugar-houses, starch and chemical works, for draining quarries and irrigating land, filling tanks at railway stations, factories, towns, mansions, ships, and dockyards.

In use at several of the largest gas-works in London.

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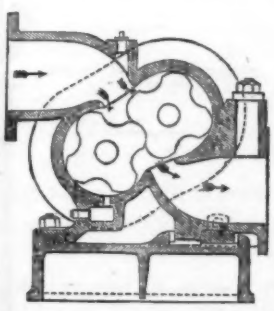
Diameter of Pipes, Suction and Delivery.	Gallons raised per Hour.
Inches.	
2	2,000
2½	3,000
3	4,500
4	7,500
5	12,500
6	18,000
7	24,600
8	31,000
9	40,000
10	49,000
11	59,000
12	71,000
14	96,000
15	110,000
16	125,000
18	160,000



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STOURBRIDGE FIRE-BRICK AND RETORT WORKS.

KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Bars, Flues, and Quarries, are all Manufactured of the same quality of Clay.

Every Retort and Brick is branded "King Brothers, Stourbridge."

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THE FARNLEY IRON COMPANY, LIMITED,

FARNLEY, near LEEDS,

Possess special advantages for the prompt and efficient execution of large orders for

FIRE-CLAY RETORTS & FIRE-BRICKS,

Of every shape and size, and of the best quality; also for their *other productions* in Fire-Clay and Terra-Cotta, including their well-known White and Coloured GLAZED BRICKS.

The F. I. Co. have the exclusive right to make and sell Fraser's Patent "Ribbed" Retorts in Fire-Clay.

Apply as above, or at their Offices,

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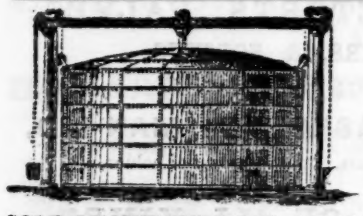

IMPROVED GAS APPARATUS,

FOR CITIES, TOWNS, VILLAGES, &c.,

INVENTED AND MANUFACTURED BY

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WHITESTONE IRON-WORKS, HUDDERSFIELD.

SOLE MANUFACTURERS of B. W. THURSTON'S IMPROVED SCRUBBER, CONDENSER, and WASHER, in use in many of the principal Gas-Works on the Continent.

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Sole Manufacturers of ESSON'S PATENT COMPENSATING GAS-METER,

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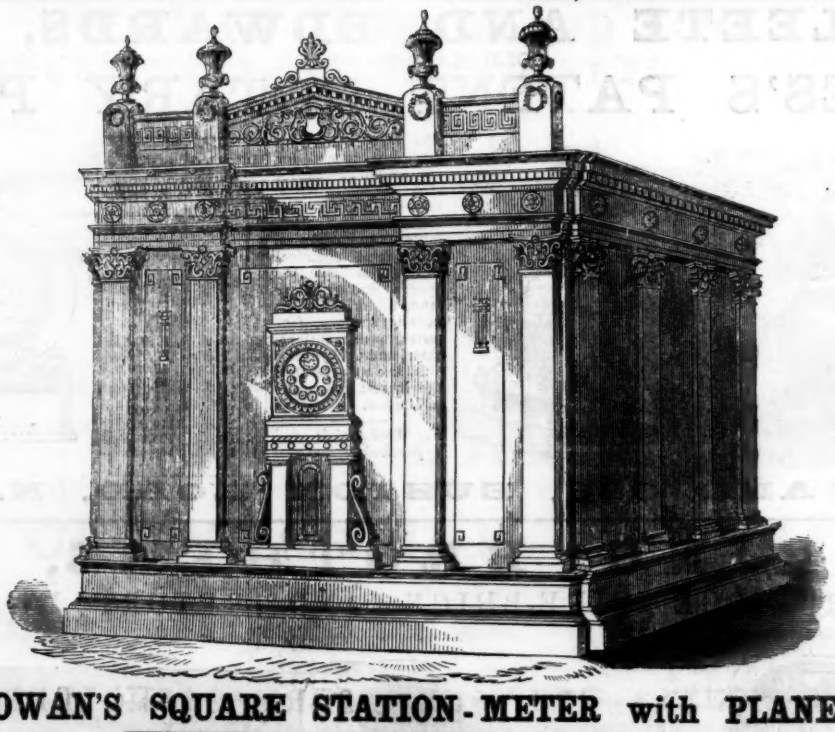

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GOVERNORS, PRESSURE REGISTERS, TEST GASHOLDERS, GAUGES, &c.

W. & B. COWAN'S DRY GAS-METERS, in CAST-IRON CASES,

Possess a simplicity of construction and facility for repair greater than any yet produced, while the excellence of the material and workmanship, and accuracy of registration, cannot be surpassed. The superiority of their Dry Meters in Tin Cases is also well known, having stood the test of years.

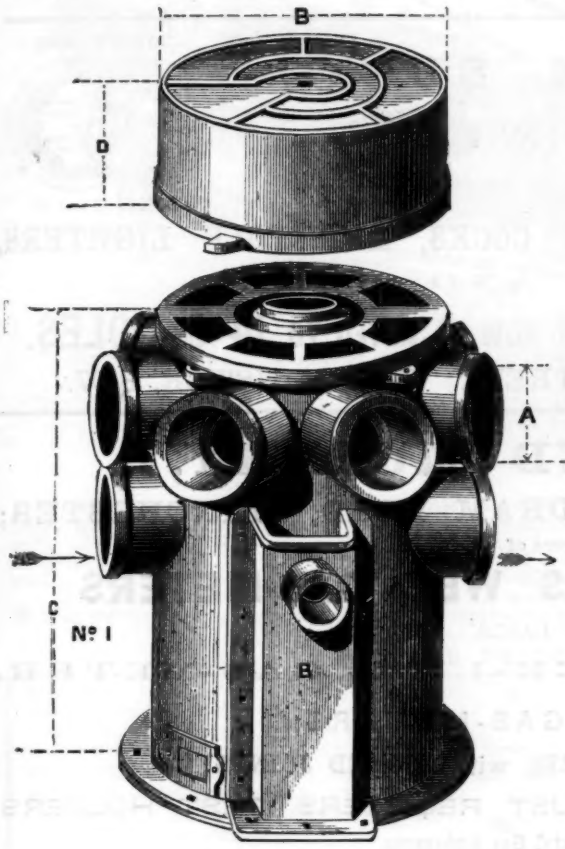
PRICE LISTS ON APPLICATION.

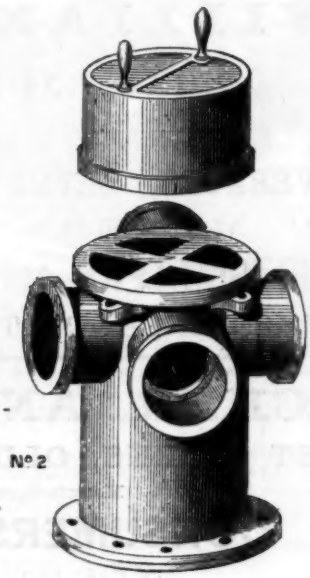
THE THORNCLIFFE IMPROVED CENTRE-VALVE,

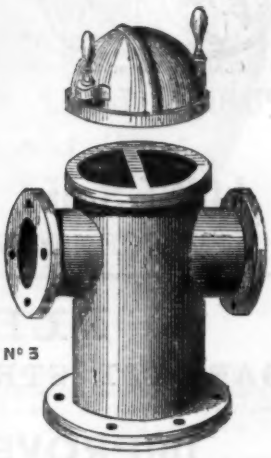
MANUFACTURED BY

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.







THORNCLIFFE IMPROVED **BYE-PASS VALVE.**

SIZES

From 3 ins. upwards.

THORNCLIFFE IMPROVED **STOP-VALVE.**

SIZES

From 3 ins. upwards.

Sizes of the

THORNCLIFFE IMPROVED CENTRE-VALVE.

		Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A	Bore of Pipe...	4	5	6	7	8	9	10	12
B	Diam. of Body.	16	20	23	26	28	31	34	40
C	Height of Tank.	33	35	38	43	46	48	51	56
D	Depth of Cover.	8	9	10	11	12	13	14	16
	Total height...	41	44	48	54	58	61	65	72

In all cases the Covers are cast heavy enough to resist any required pressure.

The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

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PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

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TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

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MANUFACTURERS of FIRE-BRICKS, LUMPS, & TILES,

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PARIS, 1867.

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GAS ENGINEER.

LONDON, 1862.

CLASSES 13 and 31.

PUBLIC LAMP GOVERNORS, LEVER COCKS, AND POLE LIGHTERS,

LAMP METERS AND BOXES.

LOWE'S JET PHOTOMETERS CAN NOW BE RATED TO 14 CANDLES.

VINCENT WORKS, VINCENT STREET, WESTMINSTER, S.W.

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GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER;

Manufacturers of

IMPROVED CONSUMERS WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

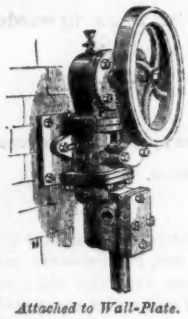
AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS,

And all kinds of Experimental Gas Apparatus.



Attached to Wall-Plate.

KITTOE & BROTHERHOOD'S

PATENT

"PARAGON" STEAM-PUMP.

Sizes Nos. 1 to 10 deliver from 75 to 21,000 gallons per hour; the height in feet being equal to twice the steam pressure in lbs. per square inch. Prices from £10 to £90

GAS COMPANY'S OFFICE, LUTON, BEDFORDSHIRE,
Feb. 23, 1870.

Gentlemen,—The Paragon Pump which I purchased of you in 1868 has been in constant use from the date of its purchase to this time, for the supplementary supply of two 8 h.p. steam-boilers. It is in request day and night, and has performed the duties required of it without needing any repairs.

Yours respectfully,

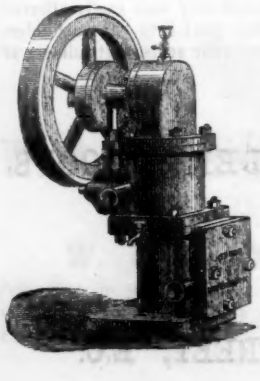
Messrs. Kittoe and Brotherhood. W. PHILLIPS.

MANAGER'S OFFICE, REDHILL GAS-WORKS,
Sept. 8, 1871.

Gentlemen,—The No. 6 Paragon Pump supplied by you has satisfactorily performed the work for which it was ordered—viz., feeding the boiler and pumping up water for the use of the works. In my opinion, it is a very compact arrangement, the working parts are thoroughly enclosed and protected, and the valves are very simply and quickly got at. It is a useful and reliable auxiliary.

Yours truly,

Messrs. Kittoe and Brotherhood. H. T. EVERIST, *Manager*.



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(LATE KITTOE & BROTHERHOOD AND FORMERLY WILLIAM FOX,)

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Manufacturers of Gas-Exhausters, Pumping and other Machinery.

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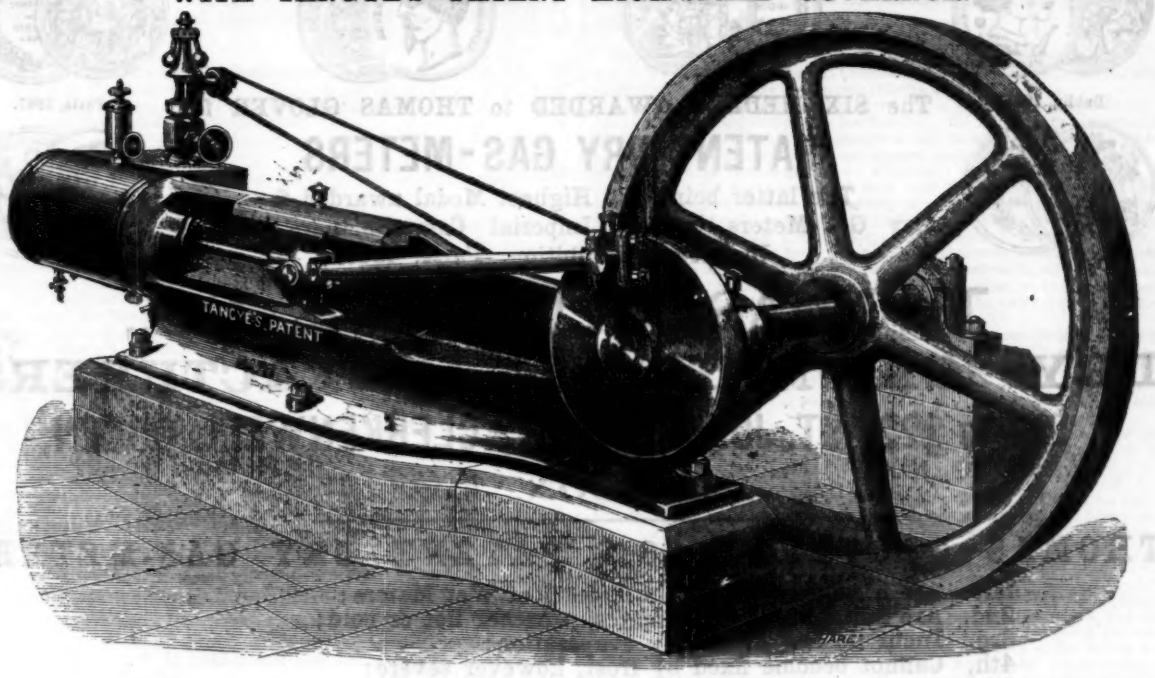
TANGYE'S HIGH-PRESSURE EXPANSIVE STEAM-ENGINES,

WITH TANGYE'S PATENT HIGH-SPEED GOVERNOR.



In this Engine the working parts are considerably reduced in number, as compared with Horizontal Engines generally, rendering it far more durable and compact. The bed-plate, front cylinder cover, cross-head guides, and plummer-block for crank-shaft bearing, are all cast in one piece, the cylinder with its valve-chest being bolted to the end of the bed. The cross-head slippers and connecting-rod ends are made adjustable, so that any wear can be readily taken up. The fly-wheel, cylinder end, connecting-rod, and crank-plate are all bright. All the parts are made to Whitworth's gauges, and the material and workmanship are of the highest class throughout.

The Governor is of a very special description, and combines, in the small space usually occupied by the ordinary steam stop-valve, a governor, throttle-valve, and stop-valve complete. It is exceedingly sensitive, simple, and compact.

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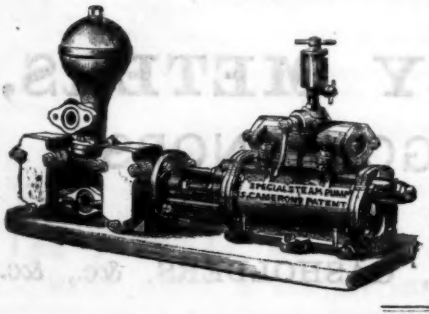

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TO CORRESPONDENTS.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 16, 1872.

Notes upon Passing Events.

OUR "Notes" on Mr. Bazalgette's scheme for the purification of the river Thames between Windsor and the western boundary of the metropolis have induced Mr. Knight, to whom we alluded, to write the following letter, which is so much to the purpose that we give it in full. It seems that Mr. Knight is not absolutely opposed to the purification of sewage by farm irrigation, but he thinks, as we do, that Mr. Bazalgette's plan will create a more dangerous and gigantic nuisance than that it professes to relieve.

Thames Sewerage Commission.

Sir,—In your issue of the 2nd inst., with reference to the above subject, you say, "We do not agree with Mr. Common Councilman Knight, that the sewage ought to be carried away and poured into the sea."

I am sure you will allow me to correct this, as it is a principle I have not advocated or advised except as a last resource; the whole of my correspondence has been to the effect that the sewage should be utilized if possible, but the place for utilization should be so situated that, in case of emergency, the sewage could be carried to the sea, and also where the drainage from it could not come into our water supply. I have very serious doubts about the advisability of collecting an enormous quantity of sewage in one place, as Mr. Bazalgette proposes, for the purposes of utilization; and I shudder at what may be the consequence should the pumping-stations, either at Hampton or Chertsey, ever be out of order even for a few hours. The accumulated sewage of nearly half a million of people would still be pouring westwards, and if the pumps did not lift it to still pass it onwards, out it must come, and must of necessity be turned into the river, and be brought back by the water companies into our cisterns.

At present, from Windsor to the intake of the water companies, we have only a population of 20,000 to 30,000 discharging sewage into the Thames; and I say it is a monstrous proposition to collect the filth produced by 300,000, and in 20 years increasing to 600,000 persons, and discharge it where it is proposed, so that the effluent water must come into that which is brought into our houses for our beverage.

The scientific evidence as to the area of land required to purify a given quantity of sewage, or as to the degree of purity of the water flowing from such land, is so conflicting that one ought not to be influenced by it. On this point I quote a short extract from the report of Charles Jones, Esq., C.E., to the Ealing Local Board. He says: "In the evidence taken in connexion with the Birmingham sewage (population 345,000), one witness of great experience gives from 10,000 to 12,000 acres as necessary; another equally experienced, 5000; whilst a third believed that 500 acres would be sufficient for the purification; and Mr. Hawksley (no mean authority upon these matters) says, when speaking of the character of the Birmingham sewage, 'It contains in its normal or unpurified condition not more dissolved organic matter than I have found in samples collected by myself of the effluent waters of the Croydon and other sewaged meadows after such water had undergone the irrigation process.'" Therefore, let us rigidly adhere to the recommendations of the Royal Commission, 1867, "That when sufficient measures are adopted for *excluding* the sewage and other pollutions from the Thames and the sea and their tributaries, and for ensuring perfect filtration, water taken from the present sources will be perfectly wholesome, and of suitable quality for the supply of the metropolis."

Let all the sewage be utilized—not only this, but that which Mr. Bazalgette's engineering is wasting at Barking and Erith; but it must be under the conditions set forth at the commencement of this letter, and it ought to be a *sine quâ non* that no foreign sewage be taken into the Thames waterahed above the intake of the water companies. The whole scheme is one of the wildest and most ill-conceived measures ever submitted to the judgment of Parliament, and forcibly points to the necessity of an inquiry into the whole subject, under proper authority, and in due course and after mature deliberation the legislation necessary to carry out the best scheme which combined experiences may devise.

HENRY E. KNIGHT.

10, *Love Lane, Wood Street, E.C., London, Jan.* 4, 1872.

We have before us this "Bill" for creating a "Thames Sewer-" age Commission," and the thin green pamphlet which professes to describe "the plan for purifying," &c. Less information on so large an undertaking it would be difficult to present to the interested inhabitants of the district. The preamble of the Bill states that the Metropolitan Local Management Act made provision for the purification of the Thames below the western boundary (a work, by-the-by, which has not yet been completed), and goes on to state that it is desirable that works should be undertaken for the purification of the river *above* the western boundary; and that the sewage should be utilized by application to land, and that such application would be a source of profit! The Bill then proceeds to create a "Thames Sewerage Com-" mission;" to give the commission power to acquire the lands described in the deposited plans, and to construct works. Amongst the main drainage works authorized by this Act are two reservoirs—one in Chobham and one in Chertsey—surrounded by roads. We venture to ask, why run the unnecessary risk of nuisance? Why not plunge into the farm districts, where sewage would be of value, and avoid all the valuable villa land and roads leading to villas? But the next idea is even more horrible—"a " pumping-station bounded by a field adjoining the Grand Junction " Water-Works reservoirs." The notion alone is disgusting, and if there is anything in the medical "germ" theory dangerous to health, line 25, at page 13, mentions a sewer running from one of the reservoirs through a long list of parishes. The dimensions of this sewer are not given, therefore its cost is at present a mystery even to Mr. Bazalgette — not an unimportant fact in settling the capital. No hint is given whether the sewer is or is not to carry the rainfall as well as the sewage. The main drainage sewers, being too large for sewage and too small for rainfall, overflow and cast into the Thames *below* the western boundary a mixture popularly known as "Bazalgette's particular." If this is to happen above the western boundary with the large area comprised in the Bill, periods of rain-storms will be dreadful days for the water companies, for their customers, and for the whole district. Consistent in vagueness, at line 20 of page 15 of the Bill, power is taken to construct "all requisite and convenient sides, syphons, " drains, sewers, junctions, pumping apparatus, outfalls, flaps, " penstocks, works, &c." Not a word is said about *where* these

necessary appliances, and, possibly, fearful nuisances, are to be erected. With the poet we say to Mr. Bazalgette,

Gentle shepherd, tell me where?

By clause 30 the commissioners may fertilize, irrigate, and cultivate the enclosed and other lands to be acquired by them in certain parishes. As Mr. Bazalgette knows nothing about sewage farming, and as the commissioners, also knowing nothing, must farm by a committee and a majority, how are they to get on without power to create a dictator? The green pamphlet holds up before the eyes of the ratepayers to be taxed a vision of satisfactory profits. No doubt from a well-digested scheme considerable profits may eventually be realized. It is very odd, but in the section of the Bill headed "Application of Moneys Received by "Commissioners" no provision is made for the contingency of profits. According to this Bill, the commissioners may eat or drink the surplus, or spend it on salaries, or on useless works. In the end, however foolishly the works are commenced, experience will produce a surplus over working expenses, and the Commissioners may have to imitate the Fishmongers Company, who, on the occasion of a Royal wedding, sent a five-guinea bride-cake to every member of the court; or the Goldsmiths Company, who used to line the napkins of the privileged with bank notes. Having arrived at the last clause of this curious Bill, we have not discovered who are the promoters. Is it a Government measure? We think not, and yet so vast an undertaking ought to be under the responsibility of the general or the local Government. If it is the Metropolitan Board of Works, we ought to know it; for this Bill really gives unlimited powers of taxation, and unlimited powers of borrowing under an Act of Parliament that the Tammany Ring might envy. More probably Government has nothing to do with the measure; more probably rumour is right, and it is the private speculation of a certain cautious engineer and enterprising solicitor. Turning from the Bill to the pamphlet, we find that Mr. Bazalgette proposes to purchase "about three thousand acres of sandy land between Woking "and Bagshot, to be irrigated on the principle that has proved "remunerative at Croydon and at Lodge Farm, Barking." Now the methods used at Croydon and at Barking are diametrically opposite. Three thousand acres are too much for mere purification, and quite insufficient for profitable cultivation. The population for which Mr. Bazalgette undertakes to provide is 300,000. Mr. Bazalgette takes the old story, the fallacy of which has long since been exposed—100 persons to an acre. Six to eight hundred acres would be ample for purification, for utilization not less than twelve thousand acres would be absolutely required. In this explanatory pamphlet that ought to have given all details, Mr. Bazalgette carefully keeps within the mist of generalities. He talks of "*where necessary*" excluding the rainfall from the "new system," but avoids giving the actual scheme. He sets down a figure of six thousand a year for pumping, maintenance, and management, but nowhere states what height of lift, how much sewage to be lifted per diem, and how much per hour as a maximum. It is impossible to discover on what his estimated profit of twenty-four thousand a year is based. He does not state at what figure per acre he has valued the land, which is part building land, part villa accommodation land, part agricultural, part waste. He has no figure for the cost of reclamation, or for irrigation carriers, or farm buildings and roads. What does he expect to pay, in addition, for residential damage? how much to allow for farm capital at £20 to £30 per acre? Add these estimates together, and then let him say how much would be left of his £630,000 after executing miles of sewers, the number of which is blank in Bill and pamphlet. As a climax of obscurity, the map, published with explanatory pamphlet, is by some happy accident *without scale!* In this character of a sewage farmer and engineer, on which Mr. Bazalgette has entered without any qualifications for the duties, except his office under the Metropolitan Board, he seems to have taken a leaf out of the showman's book: "Pay your money at the door and you shall see what you shall see!" Up to the present time no one can tell how much is to be paid, or what there will be to see; but of one thing only we may be quite sure—that with such an operator there will be an intolerable stink!

Without the slightest sympathy with the rebels, or sentimental enthusiasts in disguise, who desire to establish a religious and political despotism under the title of Home Rule for Ireland, we do see that there is one sort of domestic legislation that might be properly economized, not in Ireland only, but in Scotland, England, and Wales. That is the department of private Bill legislation. Election petitions were once tried in London. Armies of witnesses were brought up to town, luxuriously lodged, fed, and amused at the expense of the competitors. Judges are now sent down to try election cases on the spot where the witnesses dwell, at a vast saving of time and money, and much greater certainty of justice. Why cannot some tribunal on the same principle be extended to the whole kingdom, where public works are concerned, with a final appeal to Parliament on a case stated where a question, not of fact, but of taxation, was concerned? To bring witnesses from Edinburgh or from Dublin to settle a question of water-works or railroads is equally absurd. As to the dissatisfaction of the Irish with their railroad system, in which so much good English money has been engulphed for the benefit of Irish landowners, directors, officials, and engineers, if the Irish people are in earnest, why do they not bring in a Bill for raising the purchase-money of the whole Irish system by a rate on Ireland to create an Irish Board of Commissioners to manage them on Irish principles, instead of seeking to tax the Imperial Government in order to set up a system of State railways in Ireland, which the English and Scotch, in spite of the murmurs of a few doctrinaires, do not want? The reason that Lord Clanricarde and his allies of opposite politics do not propose anything of the kind is that his countrymen, with all their delightful qualities, have an invincible desire to help themselves out of the Imperial Treasury, an invincible distrust of each other, and a perpetual thirst for place, patronage, and perquisites. All the English directors who, after investing in Irish railroads, have sat upon Irish Boards, have two or three amusing scenes in the drama to describe. First, the genial hospitality with which they were received on their arrival, especially if they brought money, the produce of bonds or preference shares; next, the angry excitement produced by any attempt on the part of the cold-blooded Saxon to look into contracts for coal, timber, iron, oil, or to abolish useless offices or cut down extravagant salaries. Every Irish director has a son, or brother-in-law, or a cousin, whose interests must be considered before those of the shareholders. Then, again, there is the Irish combative temperament, which renders a good understanding between lines, even if they only meet, not compete, most difficult. With many Irishmen a lawsuit takes the place of the old duel, and is not a punishment but a luxury.

The Times has taken up the question of "Workmen's Clubs," and brought out a very interesting correspondence. No subject can be more important. Workmen, whether single or married, require rest, society, amusement, and refreshment. These they generally find, at more or less expense, at public-houses, which in towns are every day becoming more splendid. Friendly societies of all kinds meet at public-houses, because they get the use of rooms without rent, because the landlord takes a good deal of trouble off the hands of the committee, and is not unfrequently the founder of the association. In fact, the society is frequently founded in the particular "public" which is the house of call of a particular class of workmen. Philanthropists of the Lord Shaftesbury or of the ultra-temperance school have founded working men's and cabmen's clubs on eleemosynary principles with very little success. The members have been treated in a way at once paternal and pedagogical. Self-sacrificing city missionaries have taken the government of these clubs on themselves, and framed rules which included a large amount of interference, and excluded everything like the amusement of an average healthy workman. The newspapers and books have passed through a censorship which has excluded Shakespeare and Dickens. Beer, spirits, and smoking are strictly prohibited; tea and lemonade for liquids, the publications of the Tract Society for literature, and a game of dominoes or draughts for amusements, give a pretty good idea of the workmen's club that few workmen under forty care to frequent. If such clubs are to succeed, they must be framed exactly on the plan of military clubs at the West-end, with arrangements for more sociality and amusement. It will probably be more convenient that they should be proprietary, as workmen seldom have time to sit on victualling committees. There would be no necessity to provide hot food, unless a sufficient number of single men could agree on a house dinner. The committee must be entirely composed of working men. The rules should include the supply of beer and spirits and tobacco. The house must contain a room for smoking, and at least one billiard-table. A very simple method of expelling members who make themselves obnoxious in any way would secure order. The object would be to afford workmen a place where they could meet their friends, enjoy social amusement, read the papers, look at books of reference, and transact the business of friendly or other societies without, as at a public-house, feeling compelled to drink for the good of the house. This alone would be a great advance in the temperance cause.

On Tuesday last Mr. Hawksley took his seat as President of the Institution of Civil Engineers, and delivered an address of characteristic originality and force (a report of which appears in another column). The hall of the Institution was crowded, and in the course of the hour and a half during which the President was on his legs repeated bursts of applause greeted successive "happy hits." The address covered a large field in the recent history of engineering, but the text was the superiority of private enterprise, "with all its faults," to the dreary routine of officialism and official engineers in the execution of public works. The Pre-

sident began by alluding to the late war, expressing his opinion that "our national existence" depended on the Government availing itself of the devising and constructing skill of "our expe-"rienced and practical profession for the purposes of national "defence." In another passage he treated the effect of impregnable forts as insignificant as means of defending great seaport towns as compared with ships and marine machinery. For other gems we must refer our readers to the original address, which concludes in nine axioms of advice to students, the last of which is: "Be not afraid of soiling your hands or dirtying your boots, "but be in every other respect—in thought, feeling, and conduct—"a gentleman." This advice is not only sound but thoroughly English. In France such advice would be considered an insult.

Circular to Gas Companies.

ANOTHER important gas undertaking has passed from the hands of a company into those of a Corporation. In the past session the Corporation of Huddersfield obtained an Improvement Act, one section of which authorized them to purchase the gas undertakings in their district. They have lost no time in availing themselves of the provision, and the proceedings of the Town Council we report in another column give their motives, and the terms on which they have concluded the purchase of the Huddersfield Gas Company. The transaction is highly honourable to both parties, the negotiations having been carried on in the most conciliatory spirit on the part of the Corporation, and with the most open fairness on the part of the company.

The motive for making the purchase is to secure for Huddersfield the benefits which other large towns in the North have secured by becoming owners of the gas undertakings. But the circumstances in Huddersfield are rather peculiar. The district of the Huddersfield Gas Company is not conterminous with the limits of the borough. Outside their district, but within the borough, are several smaller undertakings, supplying limited areas, so that the purchase of the large company is but the first step towards placing "the whole borough on a uniform and satisfac-"tory footing with respect to gas." The just and liberal spirit shown by the Corporation in making this purchase gives promise that no difficulties will be experienced in dealing with the other concerns which may be required to carry out in full the wishes of the Corporation.

The report of the General Purposes Committee to the Town Council, which we print elsewhere, gives a clear statement of the present condition of the company, and the terms on which the purchase has been arranged. The share capital of the company is £69,000, in £20 shares, bearing a maximum dividend calculated at £5850 per annum. The profits of the company are, however, £2000 in excess of the sum required for the statutory dividend. Besides the share capital, they have realized £8656 by premiums on the public sales of shares, and out of profits they have accumulated a reserve-fund amounting to £16,856, and they have loans on mortgage amounting to £8100, making altogether a total capital of £102,164. Of this sum £86,462 stands in the shape of works, and the rest is represented by book debts, stock, cash, and investments. Taking the most sensible view of the question, the committee of the Corporation decided that the only fair way of estimating the value of such an undertaking was to ascertain the market value of the shares, and calculate from that datum. It seems that the latest published prices ranged from £43 to £44, and the committee accordingly offered the former sum, or a total purchase-money of £125,775. The company, however, were advised that their shares were worth £50, and they declined the offer. An individual director appeared on the scene at this juncture, and expressed a willingness on his own part, without committing his co-directors, to sell his shares at 24 years purchase, or £48. The other directors presently acquiesced, and a definite offer was made by the company to sell on those terms, or £140,400. Acting upon the opinion of a practical London engineer, the Corporation committee determined on acceding to these terms, and made a provisional arrangement with the company, which the Town Council have now almost unanimously ratified. The case, therefore, stands thus: The company are to receive £140,400 net for the entire undertaking; the reserved fund of £16,856, the principal portion of which is invested in convertible securities, passes to the Corporation, who assume the mortgage debt of the company.

A curious circumstance remains to be told. In 1860, when the company were yet unincorporated, they offered their undertaking to the Corporation for £63,000, an offer the corporation were disposed to accept. But they were violently and successfully opposed by a local orator, who, at a town meeting, carried a resolution condemning the purchase. In the following year the company went to Parliament and obtained an Act of Incorporation, under which they have raised their capital to the amount named above, and have pursued a most prosperous career. The consumption of gas in Huddersfield has been more than doubled since 1860. The price has been reduced from 4s. to 3s., with discounts up to 25 per cent., while the quality of the gas has been improved up to 17 and 18 candles.

The bargain now struck is a satisfactory one to both parties, notwithstanding that the Corporation now pay more than twice the sum they might have had the undertaking for eleven years ago. Huddersfield is still an improving town, and except that a rapid increase in the price of coal may be expected, the present prospects of the Corporation are as good as the past prospects of the company. In concluding our notice of this transaction, we can only repeat that the conduct of both sides offers an example which all parties, under similar circumstances, would do well to imitate.

Very different from the simplicity, candour, and straightforwardness exemplified in the foregoing instance are the proceedings in the Ryde case, a further instalment of the report of which arbitration we publish to-day, deferring the publication of the sixth and concluding day's proceedings to our next issue. As we hinted in our last, this case presents an instance in which exaggeration on the one side and depreciation on the other are pushed to the utmost limits. The witnesses on the part of the company claimed, in round numbers, £66,000 as the worth of the undertaking, while those for the Corporation set the value at about £27,600; but both sides had recourse to the most extraordinary arguments and calculations. The witnesses for the company, for example, ignoring the fact that the statutory limit of the dividend was £2597 10s., claimed to increase the real profits to £2847 19s. 8d. by striking off the cost of the directors refreshments and some other insignificant items, and to capitalize that profit at 20 years purchase, making a sum of £56,954 13s. 4d., to which they added £8994 for surplus manufacturing power and land. On the other hand, the witnesses for the Corporation, by knocking 6d. per 1000 feet off the selling price of gas—for which, by the way, their evidence offers no satisfactory justification—reduced the proper profits, according to their calculations, to £1810 2s. 8d., which, capitalized at 16⅔ years purchase, gave a total of £30,168 12s.; but from this they deducted £2576 for past depreciation, leaving, in round numbers, £27,600 as the value of the undertaking. Thus it is seen that each side rushes to an extreme of exaggeration or underestimation. Now, it strikes us that the real question at issue between the parties is exactly that which was at once accepted as the basis of negotiations in the case we have just mentioned—viz., the value of an annuity of the statutory dividend of the company, in this instance £2597 10s. All profits realized beyond this sum belong to the public in some shape or other, and certainly the company have no right or interest in them. On this understanding the whole question might have been settled in one day, instead of occupying six days in unseemly wrangling. By adopting this means of arriving at the valuation, all questions as to the price of gas, or directors refreshments, or surplus machinery, or land, would have been eliminated, and all that would have remained for the arbitrators or umpire to decide would have been the value of an annuity of the £2597 10s.—bearing in mind all the risks attending such a description of property. Whether 16¾ years, or 20 years, or even 24 years purchase be a reasonable amount, it is for them to decide. The last published quotation of the value of the shares indicates a market value of about 16 years purchase; but, in any case, it is clear that the £2869—the difference between the capital raised and the capital expended on works, which the company must have in hand in some form or other, and which will not pass to the Corporation under the purchasing powers of the Commissioners Act—must be deducted, as well as a moderate sum for past depreciation, valued by the Corporation witnesses at £2576. Even at £45,000 or £50,000, which may be about the amount when all these deductions have been made, the purchase will be an onerous one for a town of 11,234 inhabitants. Ryde is not a rapidly extending town—it has only added about one-fifth to its population in the last decennial period—and we suspect that the authorities will not be long before they come to the conclusion that they had better have left the concern in the hands of the company.

We publish with pleasure the inaugural address of Mr. Hawksley, the recently elected President of the Institution of Civil Engineers. In the paragraph briefly alluding to our particular speciality, Mr. Hawksley, speaking with the authority which belongs to his great knowledge and experience, betrays no anxiety as to the future of established gas undertakings, but looks forward to a continued extension of the manufacture of gas on even a larger scale than at present. It does not appear to him probable that so long as we can command an abundant supply of coal the use of gas from that article will be superseded, or that the methods of distillation and distribution now in use are likely to undergo much alteration. "It is, however, of interest to know "that year by year gas undertakings are increasing in number and

"magnitude, and that the consumption of gas in nearly all our "large manufacturing towns has become doubled in every eight "years from 1840 to the present time, and that between 30 and "40 millions of private capital are now invested in the gas-works "of these kingdoms."

Dr. Eveleigh has written to a contemporary stating that the works at East Barnet have been placed at the disposal of Dr. Odling and Mr. Keates, as well as the establishment at Peckham, and that the testing-station for the gas made at East Barnet will be one mile and a half from the works. Our readers have already been informed that Dr. Letheby has been engaged by the Patent Gas Company to make continual examinations of the gas as regards its purity and illuminating power. All this is very satisfactory, and we shall wait with much interest the results of the investigations which are now to be made.

The severe gale which raged over a great part of England on the night of the 4th inst. proved destructive to one of the large gas-holders at the Northampton works. The holder, we presume, was full up, and when caught by the gale tilted on one side, breaking some of the cast-iron guide-columns 2½ feet in diameter, one of which fell on the crown, making a large hole. The gas escaped without becoming inflamed, and no injury was done beyond the destruction of the holder. When speaking of the Beckton accident, we pointed out the danger of over-filling gas-holders in windy weather. Gas managers may, in fact, take a lesson from mariners, and, watching their barometers, take in sail when a storm threatens.

Correspondence.

RYDE GAS ARBITRATION.

SIR,—You will, I am sure, kindly allow me space in your next impression to correct an error in the report of my evidence in this case, as given in your JOURNAL of the 2nd inst.

I am made to say, near the end of my examination in chief, "the increase is at the rate of £1000 a year; if the commissioners had bought the undertaking five years ago, when I advised them to, they would have saved £5000."

What I did say was: The increase in value is about £5000 a year, and if the commissioners had bought the undertaking five years ago, when I advised them to, they would have saved £20,000.

R. P. SPICE.

21, *Parliament Street, Westminster, S.W., Jan.* 11, 1872.

PATENT GAS.

SIR,—Will you kindly allow me space in your valuable JOURNAL to correct an erroneous impression which I fear has been conveyed (unintentionally, I am sure) by one part of your remarks contained in the "Circular to Gas Companies" in your issue of the 2nd inst., relative to the arrangements of this company in working Dr. Eveleigh's patent process of gas making?

My directors have not called upon Dr. Odling and Mr. Keates to make investigations upon the merits of this invention in consequence of any doubts in their minds as to the results of the process, but for the purpose of obtaining from gentlemen of unimpeachable scientific knowledge and integrity such reports of those results as can be placed before the public from time to time without fear of exception being taken to them on the ground of imperfect experimental ability or apparatus.

These gentlemen will make such experiments at Peckham as cannot be conveniently or thoroughly carried out at a work devoted to the commercial manufacture of gas and the supply of a daily consumption; but it is a mistake to suppose that the works at Barnet, or the test-house placed at a distance therefrom, will be closed to them. They will have every opportunity of employing either Peckham or Barnet works, or the respective apparatuses, as may be best suited to the particular investigation or test they have at the moment in hand.

I shall at all times be most happy to furnish you with any information you may require as to results obtained, and, as far as prudent, as to arrangements entered into by the company.

I trust you will do me the favour to insert this in your next impression.

W. H. BECK,
Secretary, Patent Gas Company, Limited.

Engineer's Office, Rectory House, Martin's Lane, Cannon Street, London, Jan. 13, 1872.

Legal Intelligence.

RYDE GAS ARBITRATION.

(*Before* C. E. CAWLEY, *Esq., M.P., and* THOMAS HAWKSLEY, *Esq., C.E., Arbitrators; and* H. A. HUNT, *Esq., Umpire.*)

WESTMINSTER PALACE HOTEL, WEDNESDAY, DEC. 20, 1871.

Mr. *George Wilson Stevenson*, examined by Mr. RICHARDS.

I am a civil engineer, practising in Great George Street, Westminster. I have practised in that capacity about 35 years. I have constructed several gas-works, and have managed such works, both large and small. I am the lessee of several works at the present time, and have been largely consulted in gas matters. I have been engaged in most of the metropolitan gas fights, and have been concerned for both corporations and gas companies in all parts of the kingdom. I have frequently been employed on arbitrations like the present. I was employed by the Corporation of Ryde to advise them as to the sum which they ought to pay for the undertaking of the Ryde Gas Company, and, in consequence, I have frequently visited the town and examined the works. The company have given me every facility for doing so, and have treated me with all possible courtesy. Mr. Garnett, the secretary, and every one connected with the company, afforded me every assistance in inspecting the works and the accounts. The statements of account laid before the arbitrators are correctly copied from the books of the company. The accounts are very well kept, and I admit the accuracy of the statements presented here as to the receipts and expenditure for the past year, but I do not admit the propriety of Mr. Spice's application of them. I recognize the method which has now received general acquiescence for determining the value of undertakings of this character by ascertaining the true maintainable net annual profits, and multiplying that by a certain number of years. That rule has become tolerably well established by practice; but I do not undertake to defend it. The rule generally is to give 20 years net profits as the purchase price of an incorporated company, and 16¾ years for an unincorporated company. The latter is exposed to competition, and has to encounter various difficulties; in fact, carries on its business on sufferance only. An incorporated company has the sanction of Parliament to open the streets and to collect its debts by a summary process, and is protected generally in conducting its affairs. Still I take it that the difference beween 16¾ and 20 years more than represents the difference in the positions of the two companies.

Mr. RICHARDS: However, it seems pretty much the rule that is adopted?

Witness: It is; but it is subject to variation. Of course its application in this case is a matter for consideration hereafter. The principle involved is simply this, that people are willing to invest money at 6 per cent. in an unincorporated company, and at 5 per cent. in a company authorized by Parliament. "Maintainable profit" must depend upon the maintainable price for gas, and everything else which goes to show annual profit. The price of gas at the present time in Ryde is 5s. per 1000 cubic feet.

Mr. RICHARDS: Do you consider, looking at the present position of Ryde——

Mr. LLOYD: I do not know whether we can go into what is a fair price for gas. All we say is that we have a right to charge 5s., and you cannot alter it.

Mr. RICHARDS: We say they base their calculations upon a certain profit derived from a 5s. price for gas; that that 5s. price, though it does in fact at the present time pay the two parliamentary dividends upon the capital raised, nevertheless that capital has been expended in such a way (as we suggest) for the mere purpose of consuming the annual profits. If they had confined their capital to a proper expenditure, 5s. would not only pay the maximum dividend, but would enable them to create a reserve-fund, so that the price of gas under the provisions of the General Act would be reduced; therefore it becomes necessary to see what price for gas can be maintained.

Mr. HAWKSLEY: We are not a committee of the House of Commons to revise their Act of Parliament. The question is, what is the effect of the Act of Parliament itself?

Mr. LLOYD: Nor are we a Court of Quarter Session.

Mr. HAWKSLEY: No. A Court of Quarter Session cannot interfere till the company have obtained their maximum dividend, laid out all that is necessary to be laid out to maintain their works, and have got their reserve-fund. Those are the three conditions necessary to enable a Court of Quarter Session to act at all—until then they have no jurisdiction.

Mr. RICHARDS: We are here, I apprehend, to ascertain what is the true commercial value of this concern.

Mr. HAWKSLEY: Having this Act of Parliament. We are subject to all the conditions which are imposed by the Act.

Mr. CAWLEY: The question was as to the maintainability of a certain price. The Act is one thing, but the facts may be another.

The UMPIRE: Mr. Lloyd has given up the point.

Mr. HAWKSLEY: Allow me to say, as it may shorten time, I do not myself think they could possibly maintain the price of 5s., because there are circumstances that might interfere with it. But then those circumstances, if they do interfere, leave the question just where it is now, because the company are entitled, before the price is reduced, to their maximum dividend, they are entitled to the maintenance of their works, and they are entitled to their reserve-fund. If 4s. instead of 5s. will do this, the works are just as valuable with a 4s. price as with a 5s. I am not arguing the point, but just stating what I conceive to be the effect of the Act of Parliament, and I say that the price of 5s. *per se*, or whether the 5s. should be 4s. 6d. or 4s., is quite immaterial.

Mr. CAWLEY: I will not argue the point now, but there is another question apart altogether from this, upon which the maintainability of the price might depend—viz., whether or not under the existing powers—taking it as permanent maintenance—the 5s. price can be maintained because there is a right. Supposing that this price was so much too high, that under other circumstances connected with Ryde it was possible it might induce competition in some shape or other, which competition would affect the price. It would be a legitimate question to put to the witness whether, looking at these circumstances, there was a probability that they would be able to keep up the 5s.

Mr. HAWKSLEY: Bearing in mind that there can be no opposition without an Act of Parliament.

Mr. CAWLEY: That is a matter of argument. I believe that under existing Acts competition could be brought about.

Mr. RICHARDS (to witness): Let me ask you—in your judgment, do you consider a 5s. price is a maintainable price at Ryde?

Witness: No; I do not. I have compared the price at Ryde with the price of gas in other towns.

Mr. LLOYD: That I do object to. Mr. Stevenson may give his opinion based upon experience, but he has no right to give particular instances. We cannot go into them.

Mr. RICHARDS: He is not giving instances.

Witness: I am going to put in a list of towns in which a less price is charged.

Mr. LLOYD: That I object to, because it is impossible for any arbitrators sitting here to determine the circumstances of each case. They cannot know what is the cost of coals, labour, or material in any of these towns.

Mr. CAWLEY: It will only come out in cross-examination. He states it generally.

Mr. RICHARDS: I do not propose to ask him particulars.

Mr. HAWKSLEY: It will take three days to investigate every case. How on earth could it be done? We must go into all the circumstances of the cost of coal and management, and everything else.

Mr. RICHARDS: I am not going to ask about these various places. I ask what induces him to say so, and he says the price of other towns in the south of England. (To witness:) Does that enable you to say that, in your judgment, a 4s. 6d. price is as much as can be maintained in Ryde?

Witness: That is one reason why I say 5s. cannot be maintained. A 4s. 6d. price is a maintainable price, and I think a higher price is not maintainable.

Mr. RICHARDS: You say that is one reason. Give us another?

Witness: I have made an independent valuation, showing the company's income and expenditure and profit; the profit being the statutory dividend which they are authorized to appropriate on the capital represented by the structure as new.

Mr. RICHARD: That is to say, you have gone into the structural value of new works at Ryde?

Witness: Of those identical works and the land, and I have added the working capital; and upon that sum, taking 9 per cent. upon £18,750, and 7 per cent. upon the remainder, I find that a 4s. 6d. price will pay the dividend and leave a surplus for reserve.

Mr. RICHARDS: In making that calculation, what is the structural value at which you put the works?

Witness: £20,250.

Mr. RICHARDS: Does that include distribution?

Witness: Yes, and land, and everything within the curtilage of the works—mains, services, meters, lamp-columns, and every single thing that goes to earn profit.

Mr. RICHARDS: What is the other expense, if any, it does not include?

Witness: It does not include the property beyond the curtilage of the works. It includes everything in the gas-works, and all that is beyond the gas-works which goes to earn profit.

Mr. RICHARDS: Upon that basis you say a 4s. 6d. price will pay the parliamentary dividend?

Witness: Yes.

Mr. RICHARDS: That is upon an assumption of what quantity of gas?

Witness: Upon their present sale of gas. I may say that the £20,250, which represents the first cost of those works, is actually about £850 per million feet of gas sold and £696 per million feet of gas made, which is considerably in excess of the usual cost of gas-works.

Mr. RICHARDS: It is probably difficult to lay down any very general rule as to the amount of capital; but is that a liberal allowance?

Witness: Very liberal. I think there is only one or two of the London companies which has so large a capital.

Mr. RICHARDS: Looking at these works, is there any reason why there should be an unusually large amount of capital per million feet of gas made?

Witness: No; quite the contrary. The works are admirably situated, and very simple with regard to supply. There is no large leading main to bring the gas from a distance into the heart of the town. They are close to the point of supply—they supply right and left of them; in fact, the position of the works is as good as possible.

Mr. RICHARDS: Notwithstanding that, you have made a very liberal allowance.

Witness: I have valued the works liberally, as they stand.

Mr. CAWLEY: I thought you said as new.

Witness: No; as they stand.

Mr. HAWKSLEY: I do not see the applicability of this.

Mr. CAWLEY: We had better not argue it now.

Mr. HAWKSLEY: I will just say why I do not see the applicability of it. Supposing I had a small piece of land, and a valuable spring upon it that might, by the money got from the spring itself, raise the value of that piece of land to an enormous amount, it could not be, though I had expended only a small sum of money in the purchase of the land, and another small sum in making the basin, that that should alter the commercial value of the property when I came to sell, after the virtues of the spring had been discovered. Whether this income comes out of a large work, or whether it comes out of a small work, or whether it comes from no work at all, it does not seem to me, though I do not wish to intervene, to be the question we are trying. We are trying the value of the income.

Mr. RICHARDS: You are trying the value of the income, but that depends upon a price which we contend is unmaintainable.

Mr. HAWKSLEY: No; Parliament has granted the capital.

Mr. CAWLEY: Parliament has not said the price is maintainable.

Mr. HAWKSLEY: We are not upon what Parliament has done. Neither Parliament nor Quarter Sessions can go into what is the structural cost.

Mr. RICHARDS: Parliament has said they shall not charge more than 5s., but it has not said that 5s. is a maintainable price.

Mr. LLOYD: If you can show me that this must necessarily lead to competition and a reduction of price, I can understand you, but for anything beyond that, this is utterly beside the question.

Mr. CAWLEY: I do not wish to say anything, because it is wasting time. I can give my view to the umpire afterwards.

Mr. HAWKSLEY: But if we are to discuss this matter with the umpire in private, it is right counsel should know what our view is.

Mr. RICHARDS (to witness): We will pass on from that. You say you have made this valuation on a liberal principle. Now, I pass to the sheet of income and expenditure which the claimants have handed in. First, there is the gas and meter rental, less bad debts and abatements, as per company's balance-sheet (1870-71), the selling price of gas being 5s. per 1000 feet, £6089 16s. 7d., and to that is added the residuals as per same, £1051 16s. 7d., making the total income, £7141 13s. 2d. Now, from that you deduct 6d. per 1000 on 23,812,000 feet, the quantity sold, to bring the selling price to 4s. 6d., which, you have stated, is the full maintainable price in Ryde. That works out, I believe, to £595 6s., and leaves a balance of £6546 7s. 2d., which you say is the legitimate maintainable income?

Witness: Yes. The 23,812,000 cubic feet includes all the gas they sold to June, 1871. I differ with Mr. Spice as to the quantity sold.

Mr. RICHARDS: You are asked how you arrive at this 23,812,000, upon which you calculate the 6d. reduction. Will you just give it?

Witness: 29,103,000 was the make of gas at the station-meter. The private consumption by meter was 20,776,000. Then I take the public lamps, which is a computation. There are 184 lamps, which I multiply by the consumption of 5 feet an hour, and I take 3300 hours per year, because there are witnesses here for the corporation who will be called to prove that is about the time the lamps are lighted in the year. I take the information given to me, and not the absolute contract, in endeavouring to ascertain the unaccounted-for gas. That works out to 3,036,000. The private consumption and the public lamps together make 23,812,000, showing the unaccounted-for gas to be 5,291,000, which is equal to 18·18 per cent. on the quantity made. I exclude the town clock and the burners on the works because they do not go to earn rental, and the gas is to all practical purposes unaccounted for.

Mr. RICHARDS: You say there is no separate charge for the town clock. I hear it stated that it is paid for.

Witness: It is in evidence that it is not paid for.

Mr. SPICE: £18 per annum is paid for the town clock.

Witness: If it is so paid it must go in reduction. It is not kept in a separate account.

Mr. GARNETT: The charge for the town clock is in the rental every quarter, £4 10s.

Witness: That is 72,000 feet to be taken off. I will not do it now, it will make but a very small difference.

Mr. RICHARDS: Then you carry over on the income account a sum of £6546 7s. 2d., instead of £7141 13s. 2d?

Witness: Yes; those are the total receipts whether the town clock is paid for or not.

Mr. CAWLEY: The quantity of gas consumed in the town clock is an estimate?

Mr. MICHAEL: Yes.

Mr. HAWKSLEY: It is an estimate on both sides. Like many town clocks it may consume double. It does not follow that the £18 represents 72,000 feet of gas.

Mr. RICHARDS: I am told it is a very good clock. (To witness:) Now turn to their expenditure account. What is the first item upon which you make a remark?

Witness: Coals; I have taken the company's own statement that the expenditure was for 3047 tons, £2439 2s. 4d. Purifying materials, as per the company's books of account, £162 8s. 11d. It does not quite accord with the figures given by them here, which were £172 11s. 11d., but I have taken on the wages out and put them under their proper heading—the next item—which is thus increased by £10. The item of wages in my statement, amounting to £601 18s. 10d., includes all the wages paid. Wear and tear I have taken the average of four years, because I think it is fair to do so, for this reason, that wear and tear is much greater in some years than in others, and whenever we can do so—I speak for myself and some others who have been associated with me in arbitrations of this kind—we get the accounts of three or four years and take the average cost of maintaining the works over the longest period we can obtain. The accounts here are obtainable for four years, and I have taken the whole period.

Mr. RICHARDS: What is your result of the average of four years wear and tear?

Witness: On buildings, machinery, &c., £221 10s. 7d.; on retorts, £208 0s. 11d. and on mains, services, and meters, £128 10s. 3d., making a total wear and tear of £558 1s. 9d. I should have taken an average of four years quite indifferently whether for or against the corporation; I think it is fair, and not because I am acting for the corporation. And I have given the company this advantage: I have not taken the wear and tear this last year on the increased business, but I have taken it equally over the four years, so that, though the company were doing an increased business during the last year, I have not taken that into account. I might properly, and probably ought to have taken it at per ton of coal carbonized or per 1000 feet of gas sold last year.

Mr. RICHARDS: Wear and tear as a rule varies very much in proportion to the business done?

Witness: Yes; in direct proportion, it must do so on an average of years.

Mr. HAWKSLEY: If you are to correct the accounts in this way, you must look into the manager's conduct, because you are really valuing the manager instead of the works. You know if there had been a bad manager he could have been changed for a good one any day. In my view it results in this: can the company maintain their dividend and do these other things? We cannot value the manager. I have had two works lately before me, in one of which was a bad manager, and in the other a very good one, and the results of their management were abnormally bad and good respectively. But this might have been reversed, and thus, I say, taking it in the way you are doing you are really valuing the manager.

Mr. RICHARDS: We do not make the slightest reflection on the manager. But we say a fair index of what has been done is the average expenditure for a certain number of years.

Mr. HAWKSLEY: I am only stating this as an expert in the matter to raise this question, that the value of the undertaking does not depend upon the conduct of the manager.

Mr. CAWLEY: With all deference it is not so. This question must come out. If Mr. Stevenson were to say this is not a fair valuation, Mr. Lloyd would have the benefit of it.

Mr. HAWKSLEY: That is not quite my point. They can make as much gas at Ryde as they can anywhere else, by a certain expenditure for wear and tear; and if this is to be gone into I do not see where it is to end. My idea is that we have to ascertain what is the fair wear and tear, and not what happens to be the wear and tear over any four years. There may have been a great many things intervening, or the company may have had an exceptionally good or bad manager. If you took one of those other towns on the south coast which have been spoken of you might find that the sum which is put down here at £595 was only £400, and you might say, "If it is £400 there it could be so at Ryde."

Mr. RICHARDS: On the other hand it might be £600.

Mr. HAWKSLEY: Then you are valuing the manager.

Mr. RICHARDS: Allow me to say what we are doing is fair and legitimate. We are taking what the manager at these particular works (against whom we have not a word to say—we admit he is a good manager) has himself done in the last four years, and we say that during those four years the average is so much.

Mr. HAWKSLEY: That does not escape me, but that does not tell me what, in the ordinary course of the proceedings of a gas company, would be the right sum to allow for wear and tear.

Mr. CAWLEY: With all deference, while that is perfectly true, this is a matter of evidence. The witness is giving his own view, and if, in examination or cross-examination, he says, "This is excessive, and better management will reduce it," we have no business to interfere.

Mr. HAWKSLEY: Every judge has a right to question and pronounce upon the admissibility of evidence on the ground that it is not applicable, and the learned counsel has asked a question which makes this inapplicable. He asks whether this is a fair mode of ascertaining the wear and tear.

Mr. RICHARDS: Mr. Lloyd does not object.

Mr. HAWKSLEY: But I am here as an expert, and I do not care for one party or the other. I do not care whether these works pass for £20,000 or £100,000; but I say this is not applicable.

Mr. CAWLEY: It is certainly a fair mode of ascertaining what, at these particular works, the wear and tear is.

Mr. CLERK: Whether the amount is fair is another question.

Mr. RICHARDS: Then I ask whether it is a fair mode of ascertaining the wear and tear.

Mr. HAWKSLEY: Then you put a question which renders it necessary, as I think, to make the remark whether it is admissible.

Mr. CLERK: Surely you will recollect that the claimants say they base their claim on the accounts of last year, because theirs is an increasing business. We say that is not fair—you must take an average. Then comes the very question whether this is a fair estimate of wear and tear.

Mr. LLOYD: They did not say that this was the actual expenditure of the year; some things were added; but our statement is that on ordinary computation it would be maintainable.

Mr. HAWKSLEY: I have a clear recollection of the evidence. They put it that such a thing was worth 1d. per 1000 upon the ordinary run of gas-works of the description. Then another witness was asked whether it should not be 1½d.—not upon these works, but upon the ordinary run of such undertakings. That was fair.

Mr. CAWLEY: But they did not take that as a calculation.

Mr. LLOYD: It was merely a justification.

Mr. CAWLEY: And so it must be in this instance. There really is no question unless you are going to raise a question to the umpire which is not raised by counsel. Is it upon the admissibility of the evidence you raise a question?

Mr. LLOYD: That it is irrelevant.

Mr. CAWLEY: And so there is much in every case; but I do not pay much attention to it.

Mr. HAWKSLEY: You know the 1½d. and the 1d. did not relate to an average of four years, and that is where the learned counsel rather forgot.

Mr. RICHARDS: It was stated that 1d. and 1½d. represented, in the experience of a gas engineer, a certain ratio of wear and tear throughout England.

Mr. LLOYD: Which we say is a reasonable amount.

Mr. RICHARDS: We are dealing with the Ryde works.

Mr. LLOYD: We said there were exceptional circumstances which made it higher in former years.

Examination continued: The next item in the account of expenditure, "Salaries of secretary, collector, and auditors, as per company's books of account £347 4s. 10d.," I make no change in. "Rates and taxes" I have altered for this reason, that I consider the company greatly under-assessed.

Mr. RICHARDS: Do you think, after this exposition, the Assessment Committee will let them off so lightly?

Mr. HAWKSLEY: You must permit me to make an observation, because the difficulty of dealing with this mode of giving evidence is extraordinary. You say the works are undervalued, but if it were admissible that we should review

the proceedings of the assessors or the Assessment Committee what would it prove? Simply that a 5s. price must be maintained. If you assess the company very highly in Ryde they must have a higher price for gas. It cuts back again, so that I really do not see how it can be gone into. I want to get through with this case.

Mr. CAWLEY: So do I, and therefore I do not see the effect of your argument.

Mr. HAWKSLEY: But when I see a thing of this kind going on, as a judge I have a right to intimate my views.

Mr. CAWLEY: You see you are only half a judge at present. I just draw your attention to this. If it were admitted on the part of the purchasers that the company could maintain their maximum dividend, your argument would be perfectly right, whether the rates charged are more or less; but if they are going to say that the company cannot maintain their maximum dividend, and therefore the annual value to be capitalized is less, then it clearly affects the annual income of the company and not the consumer.

Mr. HAWKSLEY: But you forget that the witness stated at first that they could maintain their dividend.

Mr. CAWLEY: If he has admitted that, Mr. Lloyd will deal with it when the time comes. At present I am assuming that he is dealing with the figures before me, which are very much less than the maximum dividend. (To Mr. Richards:) As you have raised the question, I do not understand why the next item, "Income-tax," comes in. It does not come out of the company, it is a personal charge.

Mr. LLOYD: It is a charge upon the profits when obtained, and not before you get to the profits.

Mr. RICHARDS (to witness): How do you deal with the item of rates and taxes?

Witness: I take the profits of the company at £1810 2s. 5d.; I allow £600 for tenant's profit, and that leaves £1200 as the assessable value of these works. If I were the Assessment Committee I should rate them at that.

Mr. MICHAEL: Have you made the statutory deductions?

Witness: All statutory deductions are made. Then I have deducted 5d. for income-tax, for I consider the company are not entitled to pay their maximum dividend free of income-tax. The income-tax must come off before they pay their maximum. If I am wrong in that, the 5d. on £1800 must come out of the statement. As it is I make the rates and taxes £327 10s. The next item, "Stationery, petty cash, and general charges, £74 18s. 1d.," is as per company's books. Then I have taken for depreciation and renewal a sum of 1 per cent. upon the structural valuation, £150. That is a sum which I consider every company ought to put aside at compound interest to reproduce the original cost of the works at the expiration of the life of the different parts, so that when the company require to renew their works they do not go to capital, but have a sum for the purpose out of past earnings. Then I take ½ per cent. on the structural value for contingencies and insurance, £75. That gives a total expenditure of £4736 4s. 9d., which deducted from the total of the receipts shows a profit of £1810 2s. 5d. I have taken that at 20 years purchase, which amounts to £36,202.

Mr. RICHARDS: Assuming for the moment that 20 years purchase is that to which they are entitled?

Witness: Yes. I then make a deduction for depreciation of works, apparatus, and plant. These works have been in existence for some time, and I have made a detailed depreciation account of each part of the works, the whole adding up to £2576—*i.e.*, the works are worse by that amount than if they were new. This leaves a value upon the 20 years purchase principle of £33,626.

Mr. RICHARDS: Let me call your attention to the company's Act of 1866, the 77th section of which says: "Nothing in this Act contained shall prejudice or alter the operation or effect of section 85 of the Ryde Improvement Act, 1854, provided that the powers of the commissioners under that Act with reference to purchasing the gas-works shall be acted upon within five years from the passing of this Act." That clause, so kept alive, is the purchase clause in the Act of 1854. I will not ask you to enter into the legal arguments, but I believe your contention is that under those circumstances the gas company at Ryde have no incorporation for this purpose as against the old commissioners and the present corporation.

Witness: You mean it is suggested that the 16¾ years principle would apply, and not the 20 years; that the corporation are not to be damaged by the fact that the company have statutory powers. Applying the 16¾ years principle, it gives £30,168 12s., and deducting depreciation as before (£2576), it will leave £27,592 12s. as the value of the undertaking.

Mr. RICHARDS: Something has been said about surplus plant. I believe all the plant upon the works has been used for the purpose of production?

Witness: It has all been used, and has all, therefore, contributed to the annual profit which is the basis of their calculation.

Mr. HAWKSLEY: Do I understand it has been all used at one time?

Mr. RICHARDS: Certainly not; I hope not.

Mr. HAWKSLEY: The main question is what is used at one time, because in all gas-works, however large, they are all used, but they are used in substitution.

Mr. RICHARDS: It is hardly the right time to enter into that, but I maintain that all which has been used has directly or indirectly contributed to the profit, and when we have estimated the amount of the profit you cannot claim anything further.

Mr. CAWLEY: If the company did not pay their maximum dividend, the surplus plant comes in; but if they do, and the capital is invested in this, they will have some difficulty in showing that they are entitled to surplus plant. But that is a matter of discussion afterwards.

Mr. RICHARDS: It would be paying for surplus plant twice over; but I do not pursue that further now.

Mr. HAWKSLEY: It does not enter into the question of profits, but it enters into the question of the security of the profits, and it takes its place, therefore, in the consideration of the number of years purchase which a well-secured profit ought to have. It also takes its place in another form in the ultimate calculation.

Mr. RICHARDS (to witness): Now with regard to the distributory apparatus, the mains, &c., is that in your judgment perfect?

Witness: No; it is insufficient. It has been admitted to be insufficient with reference to a certain 2-inch main lying between two 4-inch mains; but, independently of that, it is a fact that there are two-thirds of the whole pipeage of the town, which consists of 3-inch and smaller mains; only one-third is 4-inch and above. In my judgment it will be necessary to incur an immediate outlay for the purpose of increasing the distributory power. I should think from £2000 to £3000 would be necessary to be expended to supply proper distributory apparatus and mains in Ryde. I have not gone minutely into it; but to bring up the cost of pipeage to the expenditure in similar places would involve an expenditure of £2000 or more.

Mr. RICHARDS: Until they have this enlarged distributory apparatus is the surplus plant available?

Witness: No.

Mr. RICHARDS: So that the surplus plant for which they claim credit is useless?

Witness: They are now distributing more gas than they can do with propriety. They have felt this themselves, for they commenced to lay larger mains but were stopped by the notice.

Mr. HAWKSLEY: Was that for an increase of business or the maintenance of existing business?

Mr. RICHARDS: Or for both put together?

Witness: They are working practically with 27-10ths pressure, which is too much. They were proposing to put in a high-level main and to leave the lower part of the town to be supplied through the existing main. I dare say the cost of that would not have exceeded the £600 or £700 which Mr. Garnett named, but in my judgment that would not have been sufficient to put the distributory apparatus in proper order.

Mr. RICHARDS: Now with regard to the land and the villa residences which the company are possessed of, it is hardly within your province to value them?

Witness: I have not taken them into consideration at all; I have left them to the land valuers. I hold an opinion, however, upon the subject—that they ought not to be treated commercially—*i.e.*, ought not to be capitalized at a 7 per cent., at 20 or 16¾ years purchase—because they are not going to earn rental. The income from them is only equal to 1¾ per cent. upon the cost, and, therefore, they are a drag upon the concern and not a help.

Mr. HAWKSLEY: Supposing it had been a perfectly naked piece of land available by the corporation for further extensions, would not the possession of that perfectly naked piece of land, producing nothing, give greater value to the dividends. Supposing it were perfectly unproductive, it would still have a value in some form or other.

The UMPIRE: We have not quite come to that, only that the revenue from that piece of ground ought not to come into dividend.

Mr. LLOYD: No; he is taking it as depreciatory of the value.

Witness: It ought to be excluded altogether, and treated *qud* land. What I was going to say was, that all the land and houses outside the works not concerned at all in the business, though valuable to the company as entitling them to raise a large amount of capital, and keep up their maximum price and dividend, and therefore an element of advantage as between them and the consumers, yet is a matter which ought to be excluded as between vendors and purchasers.

Mr. CAWLEY: I understand you to say that whereas the company derive a dividend of 9 per cent. and 7 per cent. on the capital expended on this land and, only get from the land itself 1¾ per cent., therefore that the difference between this interest and the amount of dividend they receive, which comes out of gas profits, makes this land in its present form a charge upon the gas, and not a benefit.

Mr. HAWKSLEY: But is not that included in the Act of Parliament?

Mr. CAWLEY: That is nothing to do with it.

Mr. HAWKSLEY: I must have my say. Does not this appear in the schedule of the Act as a thing to be done, warranted and authorized? Therefore what have we to do with taking into account the productiveness of the land. The question is, how much contributes to the endorsement of the dividend.

Mr. CAWLEY: It raises another question.

Mr. LLOYD: But I do not think Mr. Stevenson is the person to raise the question.

Mr. RICHARDS: I call your attention to the statement made by some of the company's witnesses. I think it was stated that £1900 was paid for the lease of the land; £4681 for the freehold, and £344 for the cottages, making a total of £6925. Then there was £1620 for the value of the land within the curtilage of the works, leaving, as the amount paid for the land and houses outside the works, £5305.

Mr. HAWKSLEY: I do not understand whether that applies to the whole of the surplus land.

Mr. MICHAEL: It was simply a statement made by Mr. Clerk; we have had no evidence of it.

Mr. RICHARDS: That earns a rental of £93 1s. 9d. per annum, which is just 1¾ per cent.?

Witness: Yes. The total expenditure of capital by the company, according to their own statement, is £28,890. Deducting from that sum the land and houses, £5305, it leaves as the capital actually employed in the business, £23,585. Nine per cent. upon the old capital of £18,750 gives £1687 10s., and reckoning 7 per cent. upon the difference between the old capital and the amount expended—viz., £4835—it amounts to £338 9s., making the total dividend on the £23,585 the sum of £2025 19s. That is the amount required to pay the statutory dividend on the capital employed commercially. Taking that at 20 years purchase gives £40,519, *plus* the land and houses outside the works, £5305, making a total value of £45,824. But if we are to take it at 16¾ years, instead of 20 years purchase, then the £2025 19s. will amount to £33,766, *plus* land and houses as before, £5305, making the total value £39,071. From both these calculations there must be deducted for depreciation of works £2576, as will be proved by the witnesses for the corporation, leaving the former £43,248, and the latter £36,495. Supposing, however, the capital invested in land and houses outside the works be treated as entitled to rank with the capital employed in the business, I take the £5305 into the calculation. But I utterly deny that it should be done.

Mr. LLOYD: I wonder you took the trouble to introduce it.

Mr. RICHARDS: It was done for your information, and in the hope to elicit some little credit for ourselves.

Cross-examined by Mr. LLOYD: I have been concerned in a great many of these arbitrations.

Mr. LLOYD: I gathered from the early part of your examination that it is an established principle, whether you personally acquiesce in it or not, to take the maintainable profit and capitalize it at a certain number of years purchase?

Witness: Yes.

Mr. LLOYD: Will you point out, if you can, under what Act of Parliament, public or private, the Lands Clauses Act, or any Act affecting the Ryde Gas Company, there is anything to suggest that this should be done by an estimate of the capital expended?

Witness: I do not look upon this as a parliamentary inquiry at all. Parliament does not say what capital shall be expended. Parliament gives power to expend capital, and it fixes the maximum price of gas; but, for the purpose of an inquiry between vendor and purchaser, everything must be taken into account, and when we give 20 years purchase of your profits we have a right to assure ourselves that we are going to earn that per centage upon the sum.

Mr. LLOYD: No; you may not care to earn it; but the question is whether, if the company were undisturbed by you, we could earn it. That is the question we have to deal with, and not what may be the result to you, the corporation. It is what would have been the result to us if you had not interfered.

Witness: Excuse me, the position of the company towards its consumers is one thing——

Mr. LLOYD: I do not ask you to argue that. I ask you to point out any clause in any Act of Parliament which limits the capital to the actual expenditure.

Witness: No; there is no such thing. Power is given from time to time to raise capital for the purpose of the undertaking.

Mr. LLOYD: You see by the Act of 1866, which incorporates this company, it is stated in the preamble that the company have expended out of revenue certain sums which they think they ought to have capitalized, and then it proceeds to give the total as £18,750, with that sum added. That was the capital expended before that time. You now say the total expenditure is the sum of £23,585, therefore the difference between £18,750 and £23,585 you assume to be the total sum expended since the Act of Parliament was obtained.

Witness: No; I do not assume it; that would be about £5000 of expenditure since. But I am not going to prove the preamble of the Act of 1866.

Mr. LLOYD: The additional sum beyond that stated in the preamble of the Act and your estimate of the total expenditure is about £5000. But since then we have expended about £6000 in land, and that allows nothing whatever for

the expenditure upon the buildings reconstructed and the remainder of the work done.

Witness: There has not been a very large expenditure upon buildings.

Mr. LLOYD: There has been a reconstruction of the works?

Witness: No; not since 1866.

Mr. LLOYD: They have been added to?

Witness: Very slightly. If you have the capital account you will see.

Mr. LLOYD: I am not going into the question now as to the right to take a reduction of 6d. in the price of gas, but you have in fact reduced the price to 4s. 6d. We then come to the items of expenditure which seem to me to be more material. Let us take those you do not dispute. The alteration in the item of "Purifying material and labour" is only a transposition of figures.

Witness: There are only three items altered. If you except the items of "Wear and tear," "Rates and taxes," and "Renewals and contingencies," the others are all precisely the same.

Mr. LLOYD: We will confine ourselves to those items introduced or altered by you in the expenditure. You have taken an average of four years expenditure from the books. I am not going to ask the reason, but that is the fact. Tell me, with respect to the retorts, what is, in your judgment, the fair amount of repairs and renewals *de anno in annum*?

Witness: It varies in different works.

Mr. LLOYD: I am asking now with respect to the retorts themselves. What would you say would be the cost of renewing? You know that there are 12 retorts at the most which would require to be renewed every year.

Witness: I do not think I am prepared to tell you. I can prove, by the accounts of other companies, that repairs and renewals vary enormously. I think it is safer to take every one on its own merits. You have the account of these works before you.

Mr. LLOYD: Can you undertake, as a matter of judgment and experience, to say what is the fair average cost of renewing such retorts as you find there?

Witness: I cannot. It would be greater than in many works I know.

Mr. LLOYD: Then you will not undertake to give me an estimate of what they will cost? For ordinary repairs 1d. per 1000 feet would do, but that would not include renewal.

Mr. HAWKSLEY: But that is the cost of renewals except as to the arches, which last, according to the evidence, from 12 and 14 to 20 years, because every three years (according to the evidence, which is not denied) the retorts come out and are renewed. This, so far as retorts go, is the cost of that operation. Then, whether the retorts are set badly or well, it is only a question of three years duration, because, at the end of that time, even if they cost 1½d., they can be renewed at 1d., so that it is only a question of a short period.

Witness: It varies very much in different works. I know men who pull out their retorts every year, and some who let them go two, three, and even five years.

Mr. LLOYD: You are aware that this £152 does not represent the actual cost for the year, and that there was a large expenditure in previous years?

Witness: Yes. It is kept in a suspense account, and distributed over a course of years.

Mr. LLOYD: What is the average life of retorts such as these?

Witness: My own opinion is that a retort ought to make 1½ million feet of gas, and therefore to last three years if well set.

Mr. LLOYD: Can you tell us from the accounts in any way what the average life of these retorts is?

Witness: No. They are 9 feet long; some round and some D's; half set in fours, and the other half in fives.

Mr. HAWKSLEY: Those retorts would make 4000 feet a day?

Witness: I do not think they have.

Mr. HAWKSLEY: That may be; that is simply a question of management.

Mr. LLOYD: Suppose 12 retorts to be renewed each year, and that the cost of each was £11, or £132 in all, and add to that the incidental repair of the others, would not £152 17s. 6d. be a fair representative of the actual sum to be expended *de anno in annum*?

Witness: I am not prepared to say it is; but the cost will vary in different works.

Mr. LLOYD: As to the meters. You are aware, of course, of the circumstance that the meters had to be called in?

Witness: No, I am not aware of it; and it was not so, because the Sales of Gas Act is not in operation there.

Mr. CAWLEY: It was stated that it had been done, but not compulsorily, and that the Sales of Gas Act was not in operation.

Mr. MICHAEL: But the fact is so.

Mr. HAWKSLEY: I understood they acted in Ryde as though it were in operation, and that they put all their meters in accordance with Lord Redesdale's Act.

Mr. LLOYD: Therefore there was an extra expense in that respect in one year than another.

Witness: They could not do it all in one year. It would cause an extra expense, no doubt.

Mr. LLOYD: Have you yourself ever estimated what the fair cost of maintaining meters would be?

Witness: I do not remember that I have.

Mr. LOYD: Did you see what the meter-rental was separately by itself?

Witness: Yes.

Mr. LLOYD: Even taking £52 14s. 1d. as the estimate for repairs and keeping up, would that leave any profit on meters?

Witness: Yes; a very large, and I think not a maintainable profit. I do not think the corporation will be able to maintain it. The total profit was £170, and, deducting £52 for repairs, it leaves a balance of £118.

Mr. LLOYD: You are aware that in the repair of buildings is included the rebuilding of a cottage or house. That would not properly come under the head of repairs?

Witness: A portion would, so far as it comes under the head of substitution. I think Mr. Garnett deals very fairly with this case. There are always things in connexion with gas-works which have to be pulled down and renewed.

Mr. LLOYD: You have sometimes ventured an opinion as to what would be required for the repair of meters?

Witness: I do not remember. If you will bring a case to my recollection.

Mr. MICHAEL: In Dundee.

Mr. LLOYD: Where you gave 2½ per cent. upon £8000 for repairs.

Witness: There are exceptional circumstances in all cases. In Dundee they did the repairs themselves; they paid simply the net cost of wages. The company had been in a tentative position for a long time; they had had notice for two years that they were to be sold.

Mr. LLOYD: But you have added to the sum actually expended for that reason?

Witness: Yes.

Mr. HAWKSLEY: But it is fair to say you cannot ascertain the exact cost of meters, because the men are not employed solely in looking after them. One day they are at work in the yard, and another day perhaps in the street.

Mr. LLOYD: That makes it a less cost.

Mr. HAWKSLEY: No; the cost is just the same. It comes after all to this—What are the profits? In a small work a man will do half a dozen things.

Mr. RICHARDS: I venture to object to this reference to Dundee on the same principle as Mr. Lloyd did before.

Mr. LLOYD: But this is what the witness himself said. He adds to the sum they put down £135 2s. 6d., as a fair estimate for additional expenditure in respect to the repairs of meters.

Mr. CAWLEY: Is that in addition to what they had charged?

Witness: I should like to look at my notes to see what were the circumstances.

Mr. LLOYD: This is an estimate he made himself—an additional amount of 2½ per cent. upon the actual expenditure.

Mr. RICHARDS: It must depend upon circumstances.

Mr. HAWKSLEY: I take it that the 2½ per cent. in the Dundee case was adopted on the experience of an expert, and that it had no special reference to the particular circumstances of Dundee.

Witness: I am the best judge of how I framed that estimate, and I never frame an estimate without regard to the special circumstances.

Mr. LLOYD: But you have not given us an estimate under special circumstances in this case; you have only taken an average of actual expenditure.

Witness: No. I have relied upon the accounts, and have not made an estimate. It is easily ascertainable. I take it that meters live 15 years if in a good position. Then you have the first cost, and you have to set aside a sum which will reproduce the first cost in 15 years. I believe the company have been spending money very liberally in respect of meters, and in my depreciation account I have not taken anything for the depreciation of meters.

Mr. LLOYD: The total expenditure on meters is £726, and taking 15 years as the life of a meter it would amount to £48 10s.; add to that £4 17s., or 10 per cent., for incidental repairs, and it gives £53 7s. as the annual charge to replace the £726 and keep up the meters in the meantime. Now, the sum here charged is £52. Is it your opinion that a meter may last 15 years?

Witness: Yes, if well kept; but in these sea-side towns they often water their meters with salt water, and they do not last two years.

Mr. LLOYD: They subject themselves to a heavy penalty. You are aware of that?

Mr. LLOYD: But the company, or individual who owns the work, does it?

Mr. LLOYD: It is assuming that the law is systematically violated to swell the cost.

Mr. HAWKSLEY: Have we anything to do with it in this form? The company have no power to create a fund for meters. What they are bound to do is to take down the meters and replace them forthwith. There is no calculation possible founded on the life of a meter which is not practically useless for our purpose unless you say that 1-15th of these meters will come down every year; but there is no power to create an accumulating fund.

Mr. LLOYD: I am not assuming it, but only that if you are to keep up the meters and replace them you must estimate 1-15th every year.

Mr. HAWKSLEY: But there is no power to create a fund.

Mr. LLOYD: We must keep them up to earn the income. We know in 15 years they will be done for, and this is a calculation of so much per annum. It is estimated at £48 10s., which, with incidental repairs, 10 per cent. on that, gives a further sum of £4 17s., and this shows the total expense upon an average of years.

Mr. RICHARDS: Is this supposed to be Mr. Stevenson's evidence.

Mr. LLOYD: Certainly.

Mr. RICHARDS: Mr. Stevenson has said nothing of the kind. Mr. Lloyd does a division sum, and then asks the witness whether he agrees in it.

Mr. CAWLEY: Mr. Lloyd's proposition assumes this. He first of all took 1-15th part of the original cost, and then he adds a sum of £4 odd for incidental repairs.

Mr. MICHAEL: We assume 10 per cent. for repairs on the annual sum necessary to make every meter new at the original cost.

Mr. CAWLEY: It is 10 per cent. upon the annual portion.

Mr. LLOYD: £48 a year puts all the meters in new?

Witness: You put it so to me, but I am not prepared to take it. I can tell you this—the cost varies very much in large companies.

Mr. LLOYD: You have not given us separately what you do put for meters?

Witness: It would take some time to do it. I have taken the average of the four years for the wear and tear of mains, services, and meters, which gives me £128 10s. 3d.

Mr. LLOYD: But the meters are kept separate in the books?

Witness: Yes; I can give it you. The cost of new meters fixed in substitution of other, worn out, meters and repairs of meters, in 1868, was £63 18s. 3d.

Mr. LLOYD: Allow me just to shorten the matter. We do not seem to differ about this. We have put down £52 for meters, and £75 for mains and services. The two together come to about the same. We therefore go back to the retorts.

Witness: I have taken your accounts instead of making estimates, but, instead of appropriating as a large sum the amount spent for retorts, you appropriate a small one, and transfer to us a debt of £300.

The UMPIRE: How about the rates and taxes?

Mr. LLOYD: That is a matter of argument. I do not mean to trouble you with evidence on it.

Mr. RICHARDS: What are they rated upon?

Witness: The assessable value as now in the rate-books is £525.

The UMPIRE: For the whole of the gas-works?

Witness: The whole undertaking.

Mr. MICHAEL: They rate the works at what a hypothetical tenant is supposed to give for them.

Witness: It is £700 gross and £525 net.

Mr. HAWKSLEY: There is this anomaly about the mode of assessment: the tenant pays the rent, but he only pays upon the theoretical value to the landlord, which is a totally different thing. The Act of Parliament directs, when you are finding the value to the landlord and not the tenant, that you must proceed in a particular way, which is not applicable when a company are both landlord and tenant. It has nothing at all to do with trade profits.

Mr. LLOYD: I suppose this amount of depreciation—£2576—which you deduct, the company would be enabled to lay out, or should do so, if they continued to carry on the works?

Witness: No; so much of the life of the structure is gone, and the company's property is worth less by that sum than when it was new.

Mr. LLOYD: Then in order to get it up to the value now you put aside a sum to represent that difference.

Mr. CAWLEY: It is in fact adding £128 15s. to the charges.

Mr. HAWKSLEY: How does this come in where a company have a right to make surplus profits, and to take that sum out of surplus profits, leaving the dividend untouched? Here the calculation makes it touch the dividend, and that might be so with regard to a non-statutory company, but here they are enabled by Act of Parliament to make their maximum dividend without that dividend being trenched upon by the necessity for repairs and renewals.

The UMPIRE: Extraordinary?

Mr. HAWKSLEY: No; ordinary and extraordinary. A retort-house may require rebuilding, or a gasholder may wear out, and the company have the right to take the cost of putting in a new gasholder or rebuilding the retort-house out of surplus revenue, or out of a reserve-fund, if they have one. They are entitled to have a surplus revenue and to have a reserve-fund under their Act of Parliament, and the question before us, I apprehend, is this—Will the local circumstances enable the company to do so? If they will, taking all things into account, then it is no deduction from the calculation of value which is based upon the profits, because the divisible profits will be the same whether the gasholder is renewed or not.

Mr. CAWLEY: I told you before that I agree with you if they can maintain

their maximum dividend, but the witness's evidence is that they cannot maintain their maximum.

Mr. HAWKSLEY: No; he began by saying they could.

Mr. CAWLEY: I am dealing with the paper in Mr. Lloyd's hand, which is framed on the assumption that they cannot; the other is matter of argument.

Mr. LLOYD: I do not wish to anticipate the argument. It is quite clear that if they can make their maximum dividend and have a reserve-fund, that reserve-fund is simply an accumulation of surplus profits, and when you have deducted so much out of the reserve-fund for the purpose of the renewal you can add to it again.

Mr. RICHARDS: This argument will arise again.

Mr. HAWKSLEY: But the argument comes in properly now. An arbitrator has a right to judge and to ask whether the evidence has any application.

Mr. LLOYD: We all understood on this side of the table that at 4s. 6d. the maximum dividend could be maintained.

Witness: It can be maintained on £28,890.

Mr. LLOYD: Why not on £31,000?

Witness: On your statement of profits and unaltered rates and taxes it could.

Mr. CAWLEY: My note was this—that 4s. 6d. would pay the dividend and working expenses upon the structural value of £20,250. You now tell Mr. Lloyd it will pay the maximum dividend on the £28,890.

Witness: Yes, taking their statement of profits.

Mr. HAWKSLEY: But their statement of the profit will go a long way beyond that.

Witness: It will not pay it when all the deductions I have made are allowed.

Mr. CAWLEY: Do you intend to convey to us that, in your opinion, with the existing works, 4s. 6d. will pay the maximum dividend?

Witness: No.

The UMPIRE: You say 5s. is not a maintainable price, but 4s. 6d. is maintainable, and this would pay the dividend upon the cost of construction and leave a surplus for reserve, the cost of construction being £20,250 for works, land, mains, and everything which goes to earn profit.

Mr. HAWKSLEY: He said he had not included the land.

Witness: The land on which the works stand is included, but that which is outside is excluded.

Mr. HAWKSLEY: And you have not included the cost of the Act?

Witness: No; because if they had an Act of Parliament they would have 20 years purchase.

Mr. LLOYD: I do not know whether I need say more now. It will be a matter of argument.

Mr. RICHARDS: With reference to the assessment of the works, the corporation of Ryde are anxious to have it understood that they have nothing at all to do with what the works are assessed at, that being entirely with the local board.

Mr. MICHAEL: The local board have the power to make the rate (when dissatisfied with the poor-rate) for their own purposes.

Mr. CLERK: What does it matter whether they have power or not? As a matter of fact, they have not done so.

Mr. RICHARDS: The suggestion was that if these works passed into the hands of the body who had the regulation of the assessment, they would take very good care not to raise it.

Mr. MICHAEL: That depends upon how the profits are to be distributed—whether the profits are to go to the general ratepayers or to the gas consumers only.

Mr. RICHARDS (in re-examination): You have been told that the £152 17s. 6d. in the company's statement for retorts is not an actual sum, but is the result of a calculation.

Mr. LLOYD: It is the application of a part of a sum brought forward.

Witness: I have taken the accounts of the company, and made an average of four years. If I had excluded the last year and taken the average of the preceding three years it would have been very much higher.

Mr. RICHARDS: I dare say it is within your experience that wear and tear, on the eve of a sale, does become very small.

Witness: Very small.

Mr. LLOYD: You do not impute bad faith here?

Witness: No, I do not impute it; the works are in good repair.

The UMPIRE: I take it that the amount of the suspense account is now £432 12s.

Witness: It is reduced by stock in hand to £350. There is £70 odd of stock.

Mr. MICHAEL read the 56th section of the Local Government Act respecting the making of rates.

Mr. CLERK: It is quite immaterial, the question here is whether the rates and taxes are likely to be raised.

The UMPIRE: Whether, if things had remained as they were, the rating would be raised.

Mr. RICHARDS: The suggestion was that there was no fear of its being raised now, because those to whom the works will be transferred are those who make the rates.

The UMPIRE (to witness): Tell me the amount of money which according to your judgment the gas company should receive from the corporation for their works and property, land and all.

Witness: I have not valued the land. If 20 years purchase is applied, they should have £33,626 *plus* the value of the land outside the curtilage of the works; if 16¾ years, then only £27,592.

Mr. *C. G. Cleminshaw*, examined by Mr. CLERK.

I am a consulting gas engineer. For 14 years I had the management of the Manchester Corporation Gas-Works. I have been engaged in a great many important purchases of gas undertakings, and am familiar with the questions now under discussion. I have on two occasions visited the Ryde Gas-Works, and examined them carefully as to their capacity and present condition. I have also made an estimate of what works such as these would cost. I have considered the question of what is the annual profit derived from these works, and ascertained the commercial value at a certain number of years purchase, recognizing the principle that in some cases 20 years should be allowed, and in others less. I have gone into the question of the maintainable price of gas at Ryde, and I consider that it would be 4s. 6d. per 1000 cubic feet. I consider the capital of the company is too high, and that gas ought to be made at a lower price—consequently that a reduction should take place. The capital of the company now covers not only the gas-works, but also other and extraneous matters which have been purchased along with the works. The capital expended is £28,190, which is unquestionably considerably in excess of the cost of the works. I have gone into the question of the cost of erecting such works as those are.

Mr. LLOYD: Is it worth while to go into this? It is so utterly beside the question.

Witness: I think I can sum up in a very few words the whole of this valuation. I take first what has been proved as the capital expended, £28,190, and I deduct from that the cost of the land, £6925, less £1900, the value of the site of the works, which leaves £5025 to represent the land outside the works. Deducting that £5025 from the £28,190, it leaves the actual sum expended in land and works £23,165. My estimate of the works is £19,273, which is what they could be constructed for, including the site and everything. If the works are worth 20 years purchase, in my opinion the plant ought to be represented by the full amount of capital. If not so represented, I cannot see that they are worth the same number of years purchase, simply because the possession of such property is unquestionably attended with expenditure, and they cannot, under ordinary circumstances, make gas so cheaply as others who are in a higher position. Other influences may be brought to bear upon the company, to force them to supply gas at a lower rate, consequently the property is not worth so much money. Taking a full view of the question, the simple value of the undertaking is the structural value of the land, buildings, and apparatus—taken as new—which I estimate at £19,273. To that I add the floating capital required to carry on the undertaking, which I consider should be one-third of the year's expenditure, £2280, less residuals, £1052, or £1228, making a total of £20,501. The capital of the company is entitled to a dividend of 9 per cent. and 7 per cent., which amounts to £1810. Taking that £1810 at 20 years purchase, it amounts to £36,200, and from that I deduct Mr. Stevenson's estimate for depreciation, £2576, to bring the property down to its present value; for, although my depreciation would be slightly higher, I do not think it worth while to make any alteration. This gives £33,624 as the true commercial value of the undertaking. I have not calculated what it would be at 16¾ years purchase.

Mr. CLERK: Have you gone into a calculation based upon what the profits are?

Witness: I presume this is the sound way to go into a calculation of this sort, because the profits of a concern of this kind, which is a monopoly, do not affect the question so long as the full dividends are made. Therefore the principle of falling back upon structural value is absolutely necessary. I base my calculations entirely upon structural value. I have taken the statement of Mr. Stevenson as regards income and expenditure, and, assuming the figures are correct throughout, the company should be able to make a dividend of 10 per cent. upon this amount of capital, but not upon their amount of capital. I agree with Mr. Stevenson that it is fair to take an average of four years wear and tear, and not the amount put in the account of the last year only. I am aware that the profits appearing on the books of the company are £2847. Taking my view of it as regards structural value, I do not think the amount of expenditure really touches the question, and I merely follow out that calculation for the purpose of ascertaining at what price gas could be made at Ryde, assuming the cost of wear and tear and maintenance of works given by Mr. Stevenson is correct.

Mr. CLERK: Assuming them to be correct, do you consider the dividend could be paid with a 4s. 6d. price for gas?

Witness: The dividend could be paid upon the reduced capital only.

Mr. CLERK: In your calculation based upon structural value you include nothing for surplus plant or land?

Witness: Certainly not; the structural value includes all the land within the curtilage of the works and all surplus plant.

Mr. CLERK: Does it appear to you that at the present time the dividend is kept up in order to pay a profit, not only upon what is necessary for the construction of gas-works, but on other outlay beyond the gas-works?

Witness: Decidedly.

Mr. CLERK: If that be done, the value of the surplus plant and land is already paid for?

Mr. LLOYD: That cannot be, according to his own statement.

Mr. MICHAEL: He says he has eliminated the surplus land.

The UMPIRE: He says the £19,273 includes all the plant, but he excludes all land outside the curtilage.

Witness: You will find it includes all the plant, land, and buildings, taken as new as they now exist.

Mr. CLERK: You have gone into close detail in estimating the structural value.

Witness: Yes; it may be a little assistance to say that the land is taken at £1620.

Mr. CLERK: Have you considered at all the condition of the present distributory apparatus at Ryde?

Witness: No, I have not; I did not consider it necessary.

Mr. HAWKSLEY: Allow me to put one question, Mr. Clerk, before you put yours, because I do not understand this. (To witness:) You say that structural value should govern the amount upon which a transfer of an undertaking of this kind ought to be ascertained?

Witness: I do; I think it is an element absolutely necessary.

Mr. HAWKSLEY: Do you think that applies to parliamentary undertakings generally?

Witness: No; certainly not.

Mr. HAWKSLEY: Then how am I to understand your evidence?

Witness: It does become necessary where there is monopoly, but not with an ordinary undertaking open to competition.

Mr. HAWKSLEY: But are not most parliamentary companies open to competition?

Witness: Yes; competition regulates prices.

Mr. HAWKSLEY: Can you tell me of any parliamentary undertaking which, according to your view, is not open to competition?

Witness: I consider that gas companies are not open to competition except that competition which might be introduced by Parliament, and the effect of that competition would be a reduction in the price of gas, because the new company would be able to supply gas at a cheaper rate, their expenditure being less.

Mr. HAWKSLEY: Would not that apply to any parliamentary undertaking?

Witness: It is necessary to distinguish them. Where there is real competition the case is different, because the prices are regulated.

Mr. HAWKSLEY: But when there is no real competition, only a liability to competition?

Witness: Where there is a liability to competition, as in a case like this, the company may charge more than they should do till competition really comes in. Suppose there be no competition, the company may make 10 per cent.

Mr. HAWKSLEY: Suggest to me any parliamentary undertaking which, in your view of competition, is not open to competition. Is there any parliamentary undertaking of which there could not be two of a kind if Parliament pleased—could not be duplicated if Parliament chose?

Witness: Just so.

Mr. HAWKSLEY: Now, you think that all these undertakings ought to have their value based—because they are open to competition—upon structural value. I understand you to say that wherever this is a liability, but not an actual fact, that then the value of the undertaking ought to be based upon structural value, or, at least, that the structural value should be made the basis of the dividend?

Witness: Not quite so.

Mr. HAWKSLEY: Have you not done so here?

Witness: I have, because there is no competition, and the company can charge what price they like for their gas; but I say, if competition were to be introduced, then they could not charge that price for gas, and the price must be reduced in value. The view I take of it is this—that the test of the capital, where there is competition, is revenue, but revenue will not test it in this case. Let me assume that this company have laid out £20,000, and that this capital is only represented by £10,000 of plant, if competition were introduced they would spend their £10,000, and must reduce the price. Then comes in this other question—that if a company have laid out a certain amount of capital (£28,865 in this case), if that were only represented by plant, it would be worth 20 years purchase; but how can it be said that capital which is only represented by one-half its value can be worth 20 years purchase?

Mr. HAWKSLEY: You have not answered my question quite. Just answer this question—how would you value a transfer of the telegraphs to the Government upon that principle, they being open to competition, and, of course, it being quite possible to value their plant? Would you value the transfer of the telegraphs to the Government in this way, the companies having only so many cobwebs in the air?

Witness: Well, they have no limit to their dividends, but the gas companies have.

Mr. HAWKSLEY: This gas company's dividends are limited to 9 and 7 per cent. Suppose the telegraph companies were limited to 10 per cent., would you value them on any other plan? How would you, in that case, value the telegraphs?

Witness: I am not prepared to go into a question of that kind. It requires some little consideration.

Mr. HAWKSLEY: But the principle of value is not a very difficult thing. I am not asking you to make a valuation, but just to see how you apply the principle which you have enunciated.

Witness: I can apply this principle here, but I am not prepared to apply it to the telegraphs.

Mr. HAWKSLEY: You understand they have both revenue and structures, and I want to know how you would value the telegraphs.

Witness: I could not undertake to answer the question.

Cross-examined by Mr. MICHAEL: I have had practical experience in the management of gas-works. I held the position of sole manager in Manchester. I have not had any other practical experience in management. I have been engaged in many of the bills before Parliament relating to the transfer of gas-works—Glasgow, Leeds, &c.

Mr. MICHAEL: Supposing the Ryde Gas Company had expended £20,000 on their works, and that they earned a revenue of £500 a year, on what principle ought they to be paid for their works by the purchaser?

Witness: On their profits.

Mr. MICHAEL: Why should there be a difference in the one case and the other? In the one you take structural value, and in the other profits.

Witness: For a very good reason. In the case of the earning of £500, there is still the power of opposition existing.

Mr. MICHAEL: That would make it worth less.

Witness: If the capital were not wisely expended.

Mr. MICHAEL: Then structural value is not to be taken in all cases as the test?

Witness: No; certainly not.

Mr. MICHAEL: Tell me what are the cases in which structural value is not to be taken.

Witness: In a case of the kind you have mentioned, where a company have laid out £20,000 and have only a profit of £500, from some exceptional circumstances. They might have no power to increase their profits. If they had, then a larger price ought to be paid for the works.

Mr. MICHAEL: Take this very instance. Suppose the profits of this company were only £500 a year, how much then should be the amount paid by the corporation for the works?

Witness: I must go a little further than that.

Mr. MICHAEL: Answer the question, and give me an explanation afterwards.

Witness: I should say this, that if the company could not increase their profits beyond £500, then the value ought to be taken on the £500.

Mr. MICHAEL: But I am asking you to take this very company, with their power to raise £50,000, and with £28,890 actually expended. Suppose, instead of their present profits, they actually earned only £500, how much ought they to be paid for their works?

Witness: If they could not increase their profits——

Mr. MICHAEL: But they can increase their profits. Take all the evidence given in this case.

Mr. CAWLEY: Mr. Cleminshaw's answer is, that if they have expended £20,000, and if at their maximum they can only earn £500——

Mr. MICHAEL: But that is not the case here.

Mr. CAWLEY: Then he says that he would give more, because it is capable of increase.

Mr. MICHAEL: If it is as I put it, how much ought the company to be paid?

Witness: If they could not increase beyond £500, then I should make a valuation simply structural.

Mr. HAWKSLEY: My difficulty is to know when you would take structural value and when profits.

Mr. MICHAEL: That is just where I want to test him.

Witness: I think I have stated it. I say assuming, for example, that a company have laid out £20,000, and the value of their plant is £20,000, then that company is almost safe from competition; but if they have laid out the £20,000, and their plant is only worth £10,000, then they are in great risk of competition, and their property, instead of being worth 20 years purchase, is not worth so much.

Mr. HAWKSLEY: But that is not an answer to the question. Suppose they have laid out £20,000 and have a profit of only £500?

The UMPIRE: And cannot earn more?

Mr. MICHAEL: Come to my question—expenditure, £28,000; structural value, £20,000; profits, £500. How much ought to be paid by the purchaser?

Witness: Simply upon the profit of £500.

Mr. MICHAEL: Put in words the principle which governs the taking of profits and not structural value.

Witness: In the case of a profit of £500 there could be no competition.

Mr. MICHAEL: Why? Explain that.

Witness: It would not be worth while.

Mr. MICHAEL: Is it only where gas companies are earning large profits that there is to be competition?

Witness: Usually it is so.

Mr. MICHAEL: Although another company might come in and by better working make larger profits?

Witness: Either larger profits or supply gas cheaper.

Mr. MICHAEL: Do I understand you to say that the taking of structural value as a basis is simply dependent upon the fact whether there can be competition or not?

Witness: I do not see what is the whole bearing of the case, but I should say it would.

Mr. MICHAEL: Then the liability of competition is the one governing fact which determines you whether structural value or profits should be taken as the basis of calculation?

Witness: In gas-works.

Mr. CAWLEY: You say gas-works; but why does a gas company, if all the circumstances are similar, differ from another company?

Witness: That I think I have explained. The difference is in this respect, that a gas company have the privilege of making their full dividend without competition—they are entitled to their full rate of dividend—but in almost all ordinary undertakings there is an absolute competition. Wherever there is no competition there can be no regulation of prices, and a gas company may, under such circumstances, spend just as much money as they like, and make their full dividend upon that excess of capital. Now, there is no check upon the expenditure of capital unless you take structural value or price of gas.

Mr. HAWKSLEY: What check does structural value or price of gas place upon that condition of things?

Witness: Well, taking structural value, it at once reduces the capital of this company upon which they are entitled to pay dividend.

Mr. HAWKSLEY: Entitled?

Witness: Upon which they pay dividend from £28,890 to £19,273.

Mr. HAWKSLEY: But what do you mean by "entitled?" Are they not entitled to take the dividend which the Act of Parliament gives them?

Witness: Undoubtedly they are.

Mr. HAWKSLEY: And is not that upon their actual *bonâ fide* capital?

Witness: It is upon their nominal capital.

Mr. MICHAEL: Let us understand what you do mean to say. They are entitled to take 9 per cent. and 7 per cent. upon their "nominal" capital?

Witness: What I call their nominal capital is the amount they have actually expended.

Mr. MICHAEL: Is that the way in which you have proceeded in your calculations?

Witness: No.

Mr. MICHAEL: What do you mean by "nominal" capita?

Witness: I take their nominal capital at £23,000.

Mr. MICHAEL: Is not their nominal capital £50,000?

Witness: I see what you mean—expenditure.

Mr. MICHAEL: Where do you find the word "expenditure" in their Act?

Witness: Called-up capital.

Mr. MICHAEL: Is not their called-up capital £31,750?

Witness: I am aware it is.

Mr. MICHAEL: And are they not entitled to have 9 per cent. upon a portion and 7 per cent. upon the rest?

Witness: They claim 9 per cent. upon £31,000.

Mr. MICHAEL: No, they do not, indeed. Is there anything to prevent their paying 9 per cent. upon £18,750, and 7 per cent. upon the balance?

Witness: I suppose legally there is not.

Mr. MICHAEL: Then I want to ask you this. Is not there this check upon calling up the capital? Would shareholders be likely to pay up money in an undertaking where it would be impossible to get, according to your own showing, any dividend on such capital?

Witness: Yes.

Mr. MICHAEL: You think shareholders would pay up capital when there was nothing to pay dividend upon it? Is not that a check upon the excessive amount of capital?

Witness: Yes; but the shareholders may be in ignorance of the fact of the excessive expenditure of capital.

Mr. HAWKSLEY: How would that alter it? Supposing the capital called up two or three years ago amounted to £28,000, and dividends were paid upon that. Then, at a meeting of the company, it is shown to the shareholders that for some purpose £3000 or £4000 more is wanted, and that money the shareholders agree to call up. Part is expended and part of it remains in the bank, or is invested temporarily for the production of interest, which goes into profit, and remains so for a little time till wanted. What is there in the Act of Parliament, all this being done *bonâ fide*, to prevent the dividend being paid upon that amount?

Witness: Of course, they may call up their capital and pay up dividend only.

Mr. CAWLEY: Mr. Hawksley put in the words *bonâ fide*.

Mr. HAWKSLEY: I mean *bonâ fide*, but they are not bound to expend the money exactly on the day they receive it. If it is wanted for a *bonâ fide* purpose they may spend £100 to-day and £2000 next month. But what is there, I want to know, as touching your system of valuation, which would prevent the company from paying a dividend, according to the parliamentary rate, upon the amount so called up?

Witness: Of course, there can be no doubt about it, but then there is another question—suppose they call up this excessive capital, and then comes the outside pressure for a reduction in the price of gas, the capital, which, when called up, paid 9 per cent., would not afterwards pay more than 7 per cent.

Mr. HAWKSLEY: What do you mean by pressure?

Witness: I mean an agitation for a reduction in the price of gas—a reasonable and rational agitation. Suppose the corporation, for instance, were to find from examination and comparison with other towns, that the price of gas in Ryde was too high, they might bring a very strong pressure on the company for the purpose of reducing the price.

Mr. HAWKSLEY: You mean moral pressure?

Witness: Moral; or they might take other pressure. They might apply to introduce a bill into Parliament to construct works of their own.

Mr. MICHAEL: But could the corporation with power already to purchase these works, introduce a bill to build other works? You see this company have power to expend £50,000 on the gas-works. Suppose they had expended that money, and had this revenue of £2847, how much do you say, in that case, should be paid for the works?

Witness: In that case I should simply take it upon the revenue—upon the profits rather?

Mr. MICHAEL: Tell me why?

Witness: Simply because it could not be valued at a greater sum than the profits give.

Mr. MICHAEL: But the profits multiplied by 20 years would come to more than £50,000?

Witness: I was assuming that the profits would be less—well, if they made the full rate of dividend—I see the point.

Mr. MICHAEL: I want to know what is the principle upon which in one case you take profits, and in the other structural value?

Witness: I think I have already explained that point.

Mr. MICHAEL: I must say I have not heard it?

Witness: If there is an excessive capital there must be an excessive price of gas for the purpose of paying dividend upon it.

Mr. CAWLEY: To my mind the answer is perfectly clear. He says if you had gone and spent £50,000 on works for which an expenditure of £25,000 would do, he does not consider you ought to deal with the £50,000 but structural value.

Mr. HAWKSLEY: The question was, supposing the company had expended £50,000—the whole of their authorized capital—and that they were earning only £2800 a year, upon what principle would you then value the undertaking?

Mr. CAWLEY: Then he answers that by saying on the £2800 a year, which would be less than the maximum dividend.

Mr. MICHAEL: He has told me the fact, but what is the principle? Why should he in the one case take the structural value and in the other the profits?

Witness: Suppose £50,000 had been well laid out, and the profit was only £2800, would competition be possible? I say not; and then as the company are perfectly safe from competition, therefore I take the value upon the revenue.

Mr. HAWKSLEY: Suppose the revenue were only £2000?

Witness: Then I should take the £2000.

Mr. HAWKSLEY: What would 20 years purchase come to?

Witness: £40,000.

Mr. HAWKSLEY: But the company would have spent £50,000.

Witness: They would only get £40,000, because the capital was not wisely spent.

Mr. HAWKSLEY: But the gas company are constituted by Act of Parliament for ever, with "perpetual succession." If allowed to go on perpetually the £2000 a year may become £10,000, because the profits may increase from year to year.

Witness: Now you are introducing another element.

Mr. HAWKSLEY: No, I am not. The corporation step in presumably whenever they please, and they step in when the company are making £2000 a year only, having expended £50,000. Upon what principle should you then value them?

Witness: I should value them at £2000.

Mr. HAWKSLEY: You would give them £40,000 for the £50,000 outlay, with a possibility of making in the future £10,000 a year.

Mr. CAWLEY: If they had paid £2000, and there was a reasonable probability of its increasing, how should you value?

Witness: On the £2000.

Mr. MICHAEL: Then though this company are increasing £500 a year you would make no difference in your calculations.

Witness: Then another element comes in. They have agreed to sell upon the present status of the company.

Mr. MICHAEL: The present status of the company, you must remember, is that they are increasing at the rate of from 15 to 20 per cent. year by year.

Mr. CAWLEY: How can we take that in the face of the Act of Parliament, unless you mean to say that there is no such a thing as limitation of dividend.

Mr. LLOYD: When we come to what is the limit by the Act of Parliament, there are many other points to be considered.

Mr. MICHAEL: I put it from the evidence we have already had that the company are improving year by year, and that it is worth 5000 more this year than it was before, would it make any difference whatever in your estimate of the value of the undertaking that it was stationary or progressively increasing?

Witness: The gas company do not claim anything for that.

Mr. MICHAEL: That is not an answer to my question. Would it make any difference in your valuation whether £2847 per year was a fixed sum, or whether that sum was continually advancing by increments of 20 per cent. per annum; would you then increase the valuation?

Witness: No, I should not.

Mr. MICHAEL: Then it would make no difference to you in buying a concern whether you knew that the profit was an annual sum of £2000 or that next year it would be £2400.

Witness: I should make none.

Mr. MICHAEL: Is it of any value to a gas company that they have the power to make a reserve-fund?

Witness: In this case I should say it is not—not in the light in which I have taken it—because with such a dividend I should consider that the gas company have the power to charge such a price for gas as would cover all contingencies, not only the wear and tear, but the reconstruction.

Mr. MICHAEL: With great deference, that is not an answer to my question. Is it of any value to the gas company to have power to form a reserve-fund?

Witness: Well, that is a question which is rather curiously put. Assuming——

Mr. MICHAEL: No, do not assume; say "Yes" or "No," and explain afterwards. Is it of any value to a company to have the power to form a reserve-fund?

Witness: The question is a difficult one from the two different ways of looking at it. There ought really to be no advantage whatever, because if a sufficient sum be laid aside for depreciation, then the company are in a thoroughly sound position. If they had the power to lay aside a certain surplus beyond that, it would make its position, I might say, more secure, but it is not needed.

Mr. MICHAEL: Would you kindly say "Yes" or "No." In your opinion is it of value to a gas company to be able to form a reserve-fund?

Witness: No; it is not.

Mr. MICHAEL: Then you put nothing down here for the value of a reserve-fund?

Witness: No.

Mr. MICHAEL: Then suppose the company had no reserve-fund, and by the explosion of a gasholder £5000 had to be expended, where would you get the £5000 from?

Witness: Out of profits.

Mr. HAWKSLEY: What would become of the dividends?

Witness: I should lay aside year by year a sufficient sum for depreciation to cover all these things.

Mr. MICHAEL: What is the sum you would put aside for depreciation?

Witness: 1½ per cent. upon the structural value.

Mr. MICHAEL: You think that would cover all contingencies?

Witness: It ought to do so.

Mr. MICHAEL: But what would the depreciation-fund be? Would it not be a fund to meet the depreciation in buildings?

Witness: It would be a fund to meet all contingencies.

Mr. MICHAEL: To take my case of the gasholder, which cost £5000, how long would it take your depreciation-fund to get up to £5000 at the rate of 1½ per cent?

Mr. CAWLEY: To suppose £5000 for a gasholder is to suppose what could not be.

Mr. MICHAEL: Well, take £1000?

Witness: It would be £300 a year.

Mr. MICHAEL: Then you would put by £300 a year on a capital expenditure of £20,000. Have you put down £300 a year for a depreciation-fund here?

Witness: There is no necessity for it.

Mr. MICHAEL: Then how do you provide for it?

Witness: I take the structural value as the capital basis, and the company would be enabled to charge such a price for gas as to cover all those contingencies.

Mr. MICHAEL: I am taking your own evidence. You say the dividend the company are entitled to amounts to £1810, and you multiply that by 20 years for the purchase. Out of that have you to take £300?

Witness: Not out of that. I do not deal with revenue at all. I am merely taking structural value by itself.

Mr. CAWLEY: In order to obtain your £1810, you must be able to lay by £300 a year in addition?

Witness: Yes.

Mr. MICHAEL: Then where does it appear here?

Witness: It is not necessary. I say, that the capital upon which the company are entitled to divide is this £20,501. The dividend upon that capital would amount to £1810.

Mr. MICHAEL: But is there not that worth accruing year by year, as the worth of carrying on the undertaking?

Witness: No, certainly not. This £1810 is merely the rate of dividend; it is not a question of revenue at all. If I go into revenue, it is necessary to show what the expenditure is. On the question of structural value, this is entirely unnecessary.

Re-examined by Mr. CLERK: I have left aside entirely the question of revenue and expenditure in making my estimate, and have looked merely at the structural value of the works, adding so much for the floating capital required to carry on the concern. That brings out £20,501. The company are paying their full dividend, and when that is the case, it is necessary to ascertain what is the real structural value of the concern.

Mr. CLERK: Supposing they were paying a very small amount of dividend, and that that appeared to be all they could earn, you would take not structural value, but a certain number of years profits?

Witness: Yes. If there is the full amount of plant, it is worth 20 years purchase; if there is not, it is not.

Mr. HAWKSLEY: Are you aware that your 1½ per cent. would in 30 years exactly rebuild the whole of the works—that assuming they were all destroyed once in every 30 years, this would replace them?

Witness: Very likely—*i.e.*, at 5 per cent.; but 5 per cent. is too high a rate.

Mr. HAWKSLEY: Is not the company earning more than 5 per cent?

Witness: Yes; but I should never take it at 5 per cent., because you can borrow money at a less rate.

Mr. HAWKSLEY: But are you not aware that as a rule in all cases of this kind, whatever may be the rate of money in the undertaking is to be calculated upon as the reproductive rate?

Witness: No.

Mr. HAWKSLEY: Suppose the company increase, as is usually the case, and suppose this 1½ per cent. were put into the increasing works, would not the profit upon that increase of works be the statutory profit?

Witness: Well, I should not take it in that way.

Mr. HAWKSLEY: That is neither here nor there; but would it not as a fact be the statutory profit?

Witness: I should not deal with it in that way.

Mr. HAWKSLEY: Are you aware that this company are entitled to a reserve-fund, if they can make it, of £5000—*i.e.*, a tenth of their £50,000?

Witness: Yes.

Mr. HAWKSLEY: The interest on £5000 at 5 per cent. would be £250. You are allowing £300 for contingencies. Is not what you allow that the company may set aside out of profits by way of depreciation more than equivalent to what they can set aside under the statute?

Witness: Well, the difference would be this—in a certain number of years they would have laid aside their £5000, and there they would stop. Assuming their surplus fund had reached the amount which it could not exceed, it would be £5000; then there would be no necessity, supposing £300 a year sufficient, to lay aside £50.

Mr. HAWKSLEY: They would have no power to lay aside £50, because they would have their reserve-fund full; but what I want to come to is, whether your depreciation-fund is not in fact equivalent, and more than equivalent, to the statutory reserve-fund.

Witness: That is a matter of calculation.

Mr. HAWKSLEY: Then would not that act, so to speak, as the fly-wheel of the calculation, and influence the whole system, so that if one year there should be an accident, the reserve-fund would make up that accident, and another year it would take up the surplus.

Witness: I cannot see the difference between a reserve-fund and a depreciation-fund, if the annual amount set aside is the same.

Mr. HAWKSLEY: Suppose the company having that power, and it being their duty to have this reserve-fund, whether raised as depreciation or whether raised under the statute, would they not naturally make it up out of any surplus profits they were entitled to appropriate?

Witness: I consider them both in the same light.

Mr. HAWKSLEY: Would they, notwithstanding all these liabilities, be able to pay their dividend, and have their reserve-fund, which you say they ought to accumulate?

Witness: Yes, they would.

Mr. HAWKSLEY: Then if the dividends were backed by this reserve-fund, would they not be of greater value than if not so backed?

Witness: It would add slightly to the security of the undertaking.

Mr. HAWKSLEY: Then is not the value of the security represented by the number of years purchase at which the income must be valued. For instance, if you have money in the funds which pays you 3 per cent.——

Witness: Now here is the difference of the two principles. If you have money in the funds you have no risk whatever.

Mr. HAWKSLEY: How is that, when the funds once went down to 57?

Witness: No risk in the income, I mean.

Mr. HAWKSLEY: Was it not because the taxes would not pay the income that the funds went down to 57?

Witness: Relatively, of course, there is a risk in everything.

Mr. HAWKSLEY: Then is not that risk represented in the diminished number of years purchase?

Witness: True; that is the very basis of my argument.

Mr. HAWKSLEY: That is, as the risk becomes greater, the number of years purchase is diminished, and as the risk becomes less, the years purchase is increased?

Witness: Very true. Because there is a greater risk in the purchase of a gas company whose plant does not represent the capital expended; therefore, instead of being worth 20 years, it is worth less.

Mr. HAWKSLEY: You do not answer the question. I am upon the power to make a reserve-fund. If the company have a surplus income, out of which they can raise a reserve-fund, I ask you whether, as a matter of fact, the dividends are better secured than where they have not that power?

Witness: Even then I should say a gas company are not worth more than 20 years purchase.

Mr. HAWKSLEY: I ask whether the concern would sell for more in the market with a surplus fund than without it?

The UMPIRE: If you are paying 9 per cent. and 7 per cent. upon the capital, and have no reserve-fund, would you get the same number of years purchase as you would do if you were paying those rates of dividend and had a reserve-fund of £5000?

Witness: The security would be better.

The UMPIRE: Would you get more?

Witness: No.

The UMPIRE: Would you get less the other way?

Witness: Yes.

Mr. HAWKSLEY: Then is it not a question, not of structural value at all, but of the amount of profit, and the way that profit is secured?

Witness: Yes. Then I go on to answer they are not secured, simply because the plant of the company is of far less value than the capital.

Mr. *Thornton Andrews*, examined by Mr. RICHARDS.

I am the engineer of the Swansea Gas Company, and have been engaged in many sales of gas-works. I accompanied the other witnesses on the 8th of July last to see the Ryde works, with a view to this inquiry. I have gone into a calculation with reference to the sheet of expenditure for carrying on those works, which Mr. Stevenson has gone through, and I concur with him in the result at which he has arrived—*i.e.*, making the reduction of 6d. per 1000 feet on the quantity of gas sold, which I think it is essential to do; also taking the average of four years for wear and tear, instead of the mode adopted by the company's witnesses. I have compared these figures with the Swansea statistics. I analyze the wear and tear there yearly, and am therefore competent to say whether this is fair. In the result I arrive at nearly the same figures as Mr. Stevenson. His estimate of the net annual profit is £1810 2s. 5d., and mine is £1866 7s. 5d. I adopt the same principle that he has done, and taking 20 years purchase of the net annual profit, I arrive at a valuation of £37,327, from which I deduct for depreciation of plant £2878, making the true commercial value of the works, plant, land, and undertaking of the company £34,449. At 16⅔ years purchase it would amount to £28,228. I have gone into the question of structural value of these works, as I think that in all cases the structural value should be ascertained. We find companies sometimes with very large capitals, the structural value of whose works does not come up to the proper standard. I always check one estimate by the other as a corrective. In this case I find that the structural value of works of this magnitude, including buildings, apparatus and plant, mains, the land upon which the works stand, and also the engineer's charges for the formation of the works, and the working capital, amounts to £21,260. This is an estimate for works to produce 30 million cubic feet of gas per annum—the actual make at Ryde is 29,203,000. The capital of the company is £31,750, and on my view of the structural value of the works there is a sum of £10,490, which is not represented there at the present time.

Mr. HAWKSLEY: Does not that represent working capital and the cost of the capital?

Witness: Out of the £31,750 there is the cost of the land and buildings beyond the curtilage of the works.

Mr. HAWKSLEY: Is there not the cost of the capital?

Witness: Yes; but I should not capitalize that at 20 years.

Mr. HAWKSLEY: Would you not reckon your dividend upon it, and therefore is it not a part of the capital?

Witness: It is in the original cost of the works.

Mr. HAWKSLEY: How can it be, if you value the works as works? It does not go into the bricks, does it?

Mr. RICHARDS: If I might be allowed to say, it would be more convenient to let me examine the witness, and then after his cross-examination the questions of the arbitrators would come in.

Mr. HAWKSLEY: I quite admit that, but here is a statement which is not understood. This gentleman says there is £10,490 of capital not represented.

Witness: If this were an unincoorporated company I should only give 16½ years purchase, therefore we pay for the Act of Parliament in giving 20 years.

Mr. HAWKSLEY: The Act of Parliament would be the same whatever the income of the company, and if the income were small the Act of Parliament would be lost out of a 20 years purchase of the income.

By Mr. RICHARDS: The £10,490 represents an excess of capital which is unproductive. The £31,750, which is the total amount called up at the present moment, represents £1333 per million feet of gas, and at per ton of coal carbonized it works out £10 8s. 4d. per ton. My experience as a gas engineer enables me to say that this is an unusually large proportion of capital. The average does not exceed £800 per million feet of gas sold. The capital of the metropolitan companies is £752 per million. I think £800 is amply sufficient. My estimate of £21,260 as the structural value of this concern works out to £886 per million, so that I have made a liberal allowance.

Mr. HAWKSLEY: But how much would these works make?

Witness: 30 millions I have estimated for.

Mr. HAWKSLEY: That is what they do make; but how much can they make?

Witness: You may have an excess of retort power, and the purifying, condensing, and distributing power may be defective.

Mr. HAWKSLEY: But is it?

Witness: The distributory and condensing power is.

Mr. HAWKSLEY: What are the works within the curtilage capable of producing?

Witness: From 140,000 to 150,000 per day, which is 30 millions per annum. If you take 150,000 as the maximum per day, and multiply that by 200, which is the co-efficient generally used, you will find it brings out 30 millions per annum as the capacity of the works.

Mr. HAWKSLEY: You were not in the room when it was given in evidence that there were 57 retorts, but only 32 used.

Witness: But you must have 10 out of use. I will take 48 retorts as the working power. Suppose they do not average more than 3000 feet a day——

Mr. HAWKSLEY: The 32 retorts do make 30 millions per annum. How much will the 48 make? Is it not one-half more? Therefore the capacity of the works is not 30 millions, but 45 millions. Multiply that by your £800 per million.

Witness: £36,000.

Mr. HAWKSLEY: Now deduct from the £36,000 the cost of reforming the mains in the town as far as they want to be reformed—£2000.

Witness: I do not think £2000 would do it.

Mr. HAWKSLEY: Then take off anything you like.

Witness: I should take off £4000.

Mr. HAWKSLEY: Take off what you please.

Witness: That would leave £32,000.

Mr. HAWKSLEY: Now be so good as to add to that the value of the land which is outside the works?

Witness: I am following you—but this is not my evidence.

Mr. RICHARDS: I am very reluctant to make an observation, but this does not arise out of anything I have said——

Mr. HAWKSLEY: You will have the great advantage of cross-examining upon it after you have heard what it is.

Mr. RICHARDS: I do not appreciate the advantage. I know it is done with the best intention. If there is any question asked which you do not understand——

Mr. HAWKSLEY: I do not understand it, because the witness says it comes to £1333 per million feet sold. Then he says that £800 would be the proper sum.

Mr. CAWLEY: No, no.

Mr. HAWKSLEY: Mr. Cawley, I must have my way. He says it would come to £800; then he proceeds to estimate the capability of the works, and brings it to 30 millions. I pursue that because I see something which no one can understand, and I say that the capability of the works within the curtilage is not 30 millions, but 45 millions. I am not here as a jury, but as an expert to value the works.

Mr. RICHARDS: You are perfectly right, sir, but there is a recognized mode of doing it. You will have the opportunity of doing it hereafter.

Mr. HAWKSLEY: No; I shall never have the opportunity.

Mr. CAWLEY: What the witness said is perfectly intelligible. He said that upon the company's make of 29 millions the capital represents an outlay of £1333 per million, and that the amount he has put down as the capital represents £886 per million, although £800 would be sufficient. Then you ask him a new question altogether—how far the capability of the works is concerned.

Mr. HAWKSLEY: I am sure you misunderstood me and left out one intermediate step—i. e., that the witness was valuing this undertaking by what ought to be its cost at £800 per million. Well, the £800 per million must be not upon what is sold, but upon what is capable of being produced. I may build a work one-half larger than the existing work, but the value of that work must be taken into account.

Mr. CLERK: You must take into consideration the necessary extensions in other parts.

Mr. HAWKSLEY (to witness): Now, deduct from your £32,000 anything you like for what is deficient within the curtilage.

Witness: I cannot do it off-hand. I do not think it is fair to ask me.

Mr. HAWKSLEY: Surely, if you come here to tell us that the value is £800 per million, you ought to have gone into that.

Witness: You will have to increase the condensers, the mains in the works, and the connexions in the works.

Mr. CAWLEY (to Mr. Hawksley): Your people profess to have surplus plant to the amount of £3444. Deducting that from your calculation, you will have the capability of the works.

Mr. RICHARDS: Witness said distinctly that he put the structural value at £21,260, and that he was satisfied in doing so he had acted fairly and liberally, because, taking the amount as applicable to the quantity of gas made annually, he found it was considerably more than the average, and he went on to instance Swansea and the metropolis where it was much less. That is all he said.

Mr. HAWKSLEY: Then he went on to say that £800 per million cubic feet was a fair sum and £1333 was not. I saw immediately where the difference was—that he had not calculated upon the productive power of the works. I asked him what the productive power was, and it turned out to be 45 millions.

Mr. CAWLEY: No, no.

Mr. HAWKSLEY: I shall never get to the end of this.

Mr. CLERK: The retorts alone are equal to that.

Mr. RICHARDS: It could not be any surprise to you, for he started by saying that it was 30 millions.

Mr. HAWKSLEY: Allow me to finish—I must finish. That brought me to £36,000, and that is very far off from £20,000. Then there are deficiencies within the curtilage which should be taken off, and there are deficiencies of mains to be rectified. There is also the land beyond the curtilage to add, and this will produce a sum obviously much more than £21,260. And now, as the witness will not answer me, I will ask no more questions upon that. Is there not an excess of gasholder storeage?

Witness: I do not call it so. It is only a prudent foresight in erecting a gasholder of that size.

Mr. HAWKSLEY: Is there not an excess of land within the curtilage for making 30 million feet of gas per annum?

Witness: That is paid for in the paid-up capital of £31,000.

Mr. HAWKSLEY: I am not upon that; I am upon the £800 per million. Is there not enough land to make 45 millions.

Witness: Yes.

Mr. HAWKSLEY: Are there not buildings which are competent to the production of 45 millions?

Witness: The retort-benches.

Mr. HAWKSLEY: No; the retort buildings?

Witness: There are the skeleton buildings of the retort-house and coal-store.

Mr. HAWKSLEY: Have you not seen the photographs?

Witness: Yes.

Mr. HAWKSLEY: Do they represent the works?

Witness: Yes.

Mr. HAWKSLEY: Do you call them skeletons? Are the purifiers sufficient to purify 45 millions?

Witness: Yes.

Mr. HAWKSLEY: Are not the things I have mentioned the main features of gas-works—land, buildings, retorts, and purifiers?

Witness: There are other necessary buildings. These form part of the main structure of gas-works—they are the chief structures.

Mr. HAWKSLEY: Now I want to know what are the defects?

Witness: The defects in these gas-works, before any extensions could be made, appear to me to be that a considerable portion of the buildings would have to be removed. Were they reconstructed in the modern manner, they would be arranged differently to what they are at the present time.

Mr. HAWKSLEY: Will they manufacture 45 million feet of gas per annum without alteration?

Witness: No. They will manufacture but not purify it, nor properly condense it. The condensing apparatus and the leading mains in the works would have to be enlarged.

Mr. HAWKSLEY: What is the magnitude of the leading main in the works?

Witness: Nine inches. I do not apply that to the inlets and outlets of the gasholders.

Mr. HAWKSLEY: What would be the cost of rectifying the things necessary to be rectified to enable the works to produce 45 million feet of gas per annum?

Witness: It would involve the reconstruction of the whole of the works. I am valuing the present works.

Mr. HAWKSLEY: So am I.

Mr. RICHARDS: The witness says the present works will not manufacture 45 millions.

Mr. CAWLEY: Mr. Hawksley asks what is necessary to make the entire works so as to make and distribute——

Mr. HAWKSLEY: No; I am going on by degrees.

Mr. CAWLEY: But the sum of the whole question is what will it be necessary to expend to bring up these works so as to be capable of manufacturing and sending out 45 millions. (To witness:) If you can answer that question, do so.

Witness: I am not prepared to go into that.

THURSDAY, DEC. 21.

Mr. *T. Andrews* recalled, and examined by Mr. RICHARDS.

The only surplus power of production in these works is, I consider, in the retorts. There are 58 retorts in all; of these 38 are in use, and there should be kept in reserve two beds of fives, which is only what a prudent manager would allow. I consider the maximum make of those 48 retorts would be 33,600,000 cubic feet of gas per annum, at the rate of 3500 feet per mouthpiece daily. The company state their unaccounted-for gas to be about 13 per cent.; I believe it is 18; but, taking it at 15, the loss per annum is 5,040,000 cubic feet, which leaves the quantity of gas for sale 28,560,000 cubic feet. My estimate of £21,260 is an estimate of the structural value of the works, which would produce 29 million and sell 24,866,000 cubic feet per annum.

Mr. LLOYD: I hold this to be utterly irrelevant and a waste of time. It has nothing at all to do with the question.

Mr. RICHARDS: This evidence is introduced in consequence of the questions by Mr. Hawksley.

Mr. HAWKSLEY: I did not introduce the subject; the witness introduced it.

Mr. RICHARDS: Mr. Hawksley asked questions yesterday directed to this. The witness had said, "I have calculated upon a production of 30 millions;" upon which Mr. Hawksley asked questions to show that there was a productive power in the concern equal to a great deal more. I now say to Mr. Andrews, assuming that there is in certain portions of these works a power to produce 45 millions, let us see how your calculation sustains that.

Mr. HAWKSLEY: But the evidence of the claimants was that they use only 32 retorts, and make in round numbers 30 million feet of gas per annum; therefore, upon your witness's own evidence, with 48 retorts they would make 45 millions. My questions were only directed to the application of his £800 or £886 to the 45 millions of producing capability. And I had an object in that which, in consequence of the little interruptions that took place, I did not get to. My intention was to show, and I was going to ask the umpire to consider that question, that the evidence was not relevant to the issues we have to determine, even if it were given, inasmuch as it was not within the four corners of the Act of Parliament, they having a certain capital authorized by Parliament, which is independent of any question of what the works might be built for. But I dropped that altogether because Mr. Cawley seemed to object to it.

Mr. CAWLEY: For this reason: I never find that time is saved by leading on to an argument on the part of the arbitrators. Therefore I only put questions to get the facts, and I reserve the reasoning to a future time.

Mr. HAWKSLEY: But that is hardly fair to the parties before us or to the counsel on either side, because they ought to know, and it is only right to tell them, whether we think certain evidence is relevant or not, so that they may say what they please upon it. I think it is unfair also not to tell them what is passing in the arbitrators' mind.

Mr. CAWLEY: In the first place, I trust to the counsel to take up the points that arise in cross-examination, and I find in nine cases out of ten that they do deal with the questions which have been passing in my mind.

Mr. LLOYD: Well, I hold this is certainly irrelevant.

Mr. RICHARDS: These questions were all put for our instruction and information, and there is another point to which I may direct attention. The witness said a certain amount of outlay was necessary to raise the productive power of the whole works to what the owners say they are capable of. Mr. Hawksley asked, "What do you put down for distribution and extra condensing apparatus?" which the witness was not at the time prepared to answer.

Mr. CAWLEY: I understood Mr. Hawksley's question pointed to this—you say £800 per million is the proper amount of capital. In this case you say it amounts to £1333; but taking the maximum capability of the retorts at 45 millions, instead of 30 millions, how much is it, assuming everything else is in proportion? And then he asked how much it would take to bring the works up to that production.

Mr. HAWKSLEY: And that is a very right thing for counsel on both sides to know. It is a purely technical question, and they would not be likely to arrive at it.

Mr. CAWLEY: It is only a question of fact.

Mr. RICHARDS (to witness): You have made your calculation that the capital here amounts to £886 for a production of 30 million cubic feet of gas per annum. Taking the 28,560,000, which is the productive power for sale upon the existing retorts, and multiplying that by 886, what would be the structural value of the works then?

Witness: £25,304. Deducting from that the £21,260, which is my estimate of the structural value, there remains £4044 as the outlay required, in my judgment, to bring up the apparatus and pipeage to a sale of 28,560,000 feet per annum, so that these latter shall correspond to the retort power. I have gone into the question of how that £4044 requires to be expended. In the first place, the present engine-house, engines, boilers, and exhausters are scarcely large enough for the present make. I should recommend two 8-horse power engines to be purchased, which, with boilers and cost of setting, would amount to £580; then two exhausters to pass 10,000 feet per hour, including fixing, £100; a set of condensers similar to those at present in use (they being insufficient for the increased make), £300; a scrubber, £200; new connexions for these, also a re-arrangement of the purifiers, so that three may be worked at a time instead of two, £150. A new engine and boiler house is absolutely necessary if there are any future extensions of the retort-house. The present engine and boiler house would have to come away, as they stand exactly at the end of the retort-house, and the present engine and exhauster being at work, you could not put up new apparatus. I put that at £600, making a total of £1930 on the works. The outlay required on the mains in the town I have taken at £2000; that was the sum suggested, and I think it is a fair sum. This makes a total of £3930, and I add for contingencies 10 per cent. —together £4323—from which I deduct £217 for old material and apparatus thrown out of use, which reduces the outlay to £4106, and that I consider is required to raise the body of these works and the distributory apparatus to the productive power claimed on behalf of the retorts. This agrees with Mr. Stevenson's figures within £50.

By Mr. CAWLEY: My estimate has not been based on the structural value, but I think it well to take a view of them both.

Mr. HAWKSLEY: I thought the estimate we were now upon of £886 was taken upon a certain amount of gas made.

The UMPIRE: That is merely collateral.

Mr. CAWLEY: The estimate as to what the corporation should pay is not made on structural value at all.

Mr. HAWKSLEY: But he brings down the gross dividend to the amount which the dividend per cent. would produce if estimated on this ground.

The UMPIRE: Let me see if I understand. Mr. Andrews says, "Taking your own receipts and your own expenditure by the way in which I treat them—viz., by taking 6d. per 1000 off the receipts, and increasing the wear and tear and other expenses—I bring your net income down to £1866 instead of £2847," and he says, "I will corroborate that by showing that, if we had to erect new works altogether to produce the same quantity of gas you are now making, we should have to expend so much money—£21,260. The old capital of the company is £18,750, which at 9 per cent. produces so much, and the balance at 7 per cent. produces so much," and then he goes on to say that whether you take it upon net revenue or expenditure it is the same thing.

Mr. HAWKSLEY: But the net revenue is brought down by altering the facts to adapt them to this amount, because he takes 6d. per 1000 off the gas to begin with. Then he makes other deductions which, as a matter of opinion, I admit he has a right to do; but he alters the facts to begin with, which, as I say, he has no right to do.

Mr. CAWLEY: That is a matter of opinion.

Mr. HAWKSLEY: He says I take the price at 4s. 6d. when it is 5s., and certainly he might say any other amount which would support his figures. But it is not the fact; he is giving evidence upon a state of things which does not exist. We have only been winding and unwinding the thread; it is travelling in a circle; because any one can adapt his figures to each other by this process, and therefore I say it is not admissible evidence.

Mr. CAWLEY: With all deference to you, I say it is not an alteration of facts at all. The Act of Parliament does not tell us that we are bound to assume that 5s. per 1000 feet will be maintained for 20 years to come. The witness's evidence, whether right or wrong, is this. He says: "I do not deny that 5s. is the price now, but, taking all things into consideration, I think 5s. cannot be maintained, and therefore should not be the basis of the estimate." I venture to say this is evidence, and legitimate evidence too, of what in the judgment of the witness is the price which the purchaser will have to pay.

Mr. HAWKSLEY: If this company were charging something they had no right to charge, and made a profit on their capital they had no right to make, and did a great many other things which Parliament would not permit, this would be pertinent evidence; but here it is the fact, as I understand it, that all they have done and are doing at the present time they have a right to do. You buy them at a moment when there is a certain state of things existing, which is a state of things authorized; but this gentleman is supposing a different state of things, and I say that, according to the best of my judgment, this is not admissible evidence, and, to use a legal phrase, it is impertinent.

Mr. RICHARDS: If I might say, with all respect, it is rather a remarkable objection to take at this stage, considering that Mr. Hawksley cross-examined the witness in considerable detail on this very point, going into very minute particulars on questions which arose in his examination in chief, and at a period which I submit did not tend to facilitate business. The result was, certain difficulties were pointed out, and considering, as he himself stated, that the remarks were made for our benefit, we took advantage of the hints, and Mr. Andrews prepared the evidence he has given this morning. Certainly it is now with some surprise I hear that this is considered irrelevant.

Mr. HAWKSLEY: My remarks were tendered so as to lead to the very objection I now make, and to show that this mode of valuation is not pertinent to the case, and therefore not admissible, but I was interrupted.

Mr. LLOYD: All I care about it is this—you have got my protest. I say it has nothing at all to do with the issue. You may waste as much time as you please, if you think it material. I only say, do not assume for a moment that I have in my mind that the evidence bears at all upon the question, and I hope I shall be able to convince, if not the two arbitrators, at least the umpire, that I am right.

Mr. CAWLEY: That has nothing to do with the admissibility.

Mr. LLOYD: When it is a question of relevancy it is put to the counsel who tenders it, "Do you believe it to be relevant?" If he says, "I do," then the objection drops, because then it rests on his responsibility, but it never precludes the other counsel from saying, when the time comes, "All this may be set aside because it is irrelevant to the issue."

Mr. HAWKSLEY: Very well. I will let the thing go on without asking a single question, although I have fifty more in my mind upon this very estimate.

Mr. LLOYD: I do not propose to cross-examine upon it, because I am so certain I shall be able to convince you it is immaterial to the issue to be determined, that it is not worth while to waste time by going into it. Understand, I do not admit it. For instance, the very question about the engine power. The work is being done with a 3-horse engine; the witness wants 16-horse power, according to his statement, to produce the maximum capability.

Witness: There would be one in reserve.

Mr. LLOYD: Because I do not cross-examine, do no not suppose I admit this. There are a hundred things he has said capable of being controverted at once, but there are none of them relevant.

The UMPIRE: I am bound to say, from a very large experience, that I consider it perfectly admissible evidence, and if the learned counsel think that their case should be put upon that ground they are perfectly right to put it upon that ground. It is for us to determine whether they are right. It is a question for argument on the one hand, and for the judges hereafter.

Mr. LLOYD: You do not preclude it, but the matter may be discussed.

The UMPIRE: I say the counsel for the corporation are entitled to put before us any view of the case which they think it is their duty to present. Whether we agree with them or not is another question. The learned counsel may say, "You are doing this now, and are making so much gas, but you will not be able to continue to do that;" and they may say also, "The corporation of Ryde are going to buy something that is ill adapted for the purpose. Why should they pay £50,000 for works which they can construct for themselves for £20,000?"

Mr. LLOYD: They have a right to do it.

The UMPIRE: That is all they say.

Mr. LLOYD: We shall see what that is worth.

The UMPIRE: That is a matter for argument. With great respect to my friend (Mr. Hawksley), he is making speeches and arguing the question.

Mr. HAWKSLEY: Purposely.

The UMPIRE: I do not say whether I agree or disagree with you, but I say they are perfectly justified in putting before us any view they think necessary.

Mr. HAWKSLEY: I scarcely go that length, because we are sitting here under an Act of Parliament.

Mr. CAWLEY: That does not prescribe how the property is to be valued.

The UMPIRE: We have not had that question discussed. When counsel address us they will tell us what the Act of Parliament requires us to do.

Mr. HAWKSLEY: If the Act of Parliament tells us practically what we are to value, the assumption that something else other than what we are to value is not evidence for our purpose.

The UMPIRE: Your side of the table have put before us a claim for certain surplus plant, which leads the other side to say, "You have no surplus plant at all, and, in point of fact, your concern is insufficient for the purpose to which it is now applied." This gentleman says if you have any excess of producing power it is only in retorts.

Mr. HAWKSLEY: I will not continue the argument except to say that is not my view at all.

Mr. CAWLEY: Your proposition to limit the evidence to what is correct binds the umpire to decide what is the true evidence.

Mr. HAWKSLEY: In this, as in all cases, there is something in the nature of pleadings, and here these pleadings are found in the Act of Parliament. On the other side they say this land is only producing 1¾ per cent. I say that is nothing to the purpose so long as the Act of Parliament tells them they may pay 9 and 7 per cent. upon the capital invested in it. We have to determine upon the basis of the Act of Parliament; we cannot help ourselves, and evidence which does not go to that appears to me to be irrelevant and inadmissible.

The UMPIRE (to Mr. Lloyd): Well, I think you had better go on with your cross-examination.

Mr. LLOYD: I have no questions to ask. Only do not assume that I admit the facts which he states.

Mr. *J. E. Clift*, examined by Mr. CLERK.

I have been in practice as a gas engineer and manager of gas-works upwards of 30 years. For 20 years I was engineer of the Birmingham and Staffordshire Gas Company. I have had considerable experience in valuing gas-works, and have been engaged in a great number of arbitrations. I am at the present time proprietor of the gas-works at Redditch. In July last I visited Ryde with Mr. Stevenson. I inspected the works thoroughly, under the guidance of Mr. Garnett, and was furnished by him with a full statement of the accounts of the company, showing the income and expenditure for the last four years, as taken from the books. I have directed my experience to ascertain what in my opinion is the commercial value of the undertaking for the purpose of sale. In order to arrive at a correct view of the profits of the company, I have taken the average cost of gas per 1000 feet for each item of expenditure during the last four years—the average cost of gas sold for each item of expenditure for each of the four years. I have taken their figures as the cost of the gas during that period, and added them together. I then divided by four, which gives me the average cost of production. I considered it not right to direct my attention only to what appeared in their accounts for the last year upon this point, for when notice is given to purchase works, however careful the management may be, and however honest and well-intentioned, it is impossible to bring out the same results in the working of that year as in the ordinary course of operation. It is, I believe, therefore fair to the sellers as well as to the buyers to take an average of four years. The result of four years, under any circumstances, must be a better criterion of the cost of manufacture than the result of one year only. I have taken it, as I consider, in the fairest manner for both buyers and sellers.

Mr. CLERK: Now, in the corrected balance-sheet which you have handed in, I see you make a reduction in the price of gas of 6d. per 1000.

Witness: I take it exactly the same as the other witnesses have taken it, and deducted 6d. per 1000 feet upon consideration and consultation with the other engineers engaged in the valuation. I consider 5s. is not a maintainable price for gas at Ryde, and that a reduction must be made. The question is whether the reduction shall be made upon the price which the company get for their gas, or upon the price which the corporation will obtain.

The UMPIRE: Why is it not maintainable?

Witness: It appears to me higher than the price of gas in adjacent towns, manufactured under similar circumstances, and it is very unlikely, from the general knowledge which the consumers have of the price at which they should be supplied, comparing their town with others, that they will consent to pay this high price. That is my reason.

The UMPIRE: You say that the consumers actually would not pay 5s.?

Witness: No.

Mr. LLOYD: Then they would not have the gas.

Witness: The consumers will obtain a reduction, inasmuch as in towns adjoining gas is sold at a lower price.

Mr. CLERK: Have you taken into consideration that the price of 5s. is now maintained, I will not say for the purpose of producing, but does it, in fact, produce, sufficient to pay the full dividend, not only upon the value of the gas-works, but upon the capital expended in other things.

Witness: It is evident from the accounts that the profit on the gas has to pay interest on a large outlay for land, which is unprofitable for the purpose of gas-works, and unprofitable in itself.

Mr. CLERK: It was shown yesterday, and was not questioned, that a part of that outlay produced a profit of 1¾ per cent.

Witness: Yes; and the company paid their maximum dividend last year upon the capital, which only represents interest at the rate of 1¾ per cent.

Mr. LLOYD: That is quite true. We do not dispute it.

Mr. CLERK: From your experience, do you think the consumers at Ryde would be content to pay a price for gas which is rendered necessarily high to

furnish dividends not only upon the capital invested in the works, but also in this unprofitable part of the property?

Witness: I think, as this investigation will disclose the whole facts, and the consumers will be in possession of all the circumstances, they will be unwilling to pay a large price for gas for the purpose of paying dividends upon the unprofitable investment.

The UMPIRE: Suppose the inquiry had not disclosed this?

Witness: Then the public could not have known anything about it.

Mr. CLERK: There are many things under the head of expenditure which the public may have been ignorant of at Ryde. It now being known generally that the capital is expended not only for the purposes of the gas-works, but for other property beyond the gas-works, you think they will not be satisfied to pay a price which is to give the full dividend on that large outlay?

Witness: I certainly think not.

Examination continued: From a comparison of Ryde with other towns, I think 4s. 6d. is a maintainable price, and that a higher price will not be maintainable after this investigation. That reduces the income of the company to £6546 7s. 2d. With reference to the expenditure, I have taken it for the last four years, and averaged it. I have then taken the averages, and multiplied them by 23,812,000, which is the number of cubic feet sold in the last year, and that brings out the various items which you see in the expenditure column.

Mr. LLOYD: Understand the sale of gas is quite an estimate.

Witness: You have a different figure, because we have taken the gas sold by meter and have added to that an estimated quantity for the public lamps. We have excluded the quantity consumed at the works, and have added that to the gas lost, which gives as the difference between the gas made and sold 18 per cent.

Mr. LLOYD: You have added it to the cost, and not given us the benefit of it.

Mr. CLERK: You have added nothing to any one of these items of cost?

Witness: No.

Mr. CAWLEY: The 23,812,000 may be right or wrong.

Mr. MICHAEL: He takes the sum of the gas which produces money to the company, according to his estimate, and abstracts whatever is used on the works, because it is not productive of money to the company.

Mr. CAWLEY: I was under the impression that the money column in his statement was the result of the average of four years, and that the column per 1000 cubic feet was simply the result of dividing the money column. I find now that such is not the case, but that he first of all ascertains the cost per 1000 for four years, and he uses that as the multiplier of 23,812,000 to produce his result of £4801 10s. 11d. expenditure.

Mr. MICHAEL: The answer must be wrong, because the question is wrong.

The UMPIRE: I want to know how the decimal column is arrived at.

Witness: I take the cost of the gas for each of the four years in decimals and add them together.

The UMPIRE: And you say the £2610 16s. ought to be the cost of coal, that being the average cost for four years.

Witness: Yes.

The UMPIRE: The whole of the second column is an average of the expenditure per 1000 of each item, for four years.

Witness: Quite so.

Mr. HAWKSLEY: But it is an average upon averages, and if their expenses four years ago, when they were making a smaller quantity of gas, were larger than they are now when they are making a larger quantity, you have incorporated that larger cost in your average which would be *quo ad* this inquiry, so far valuing the undertaking upon the basis of a cost of four years ago when the company were making so much less gas.

The UMPIRE: Quite so.

Mr. HAWKSLEY: And though, by making gas in larger quantities, that may have reduced their expenses proportionately, you nevertheless, by bringing in the greater cost when the manufacture was less, make the expenses larger than what at the buying time is the actual fact.

The UMPIRE: That is so.

Witness: Yes.

Mr. HAWKSLEY: It is an average of averages.

Witness: Yes, and the fairest way of doing it. I do not consider last year would be a fair year, and to take the year before and add it to the last would not give so good an average as taking the four years. The difference in quantity between the make of gas last year and four years ago could make but the smallest fraction of difference in the result. It would not affect the saving upon coal or lime for purifying, and only to a very small degree the labour. It would make no difference at all upon the wear and tear, and therefore it is only upon the fixed charges that a saving could be effected at all. On all those items in which a certain quantity must be used to produce a certain quantity of gas, the charges will be the same in proportion to the quantity of gas made if the year's working is carried on the same.

By Mr. CLERK: The total expenditure according to my corrected balance-sheet, as really applicable to future years, is £4801 10s. 11d.; to that I add 1 per cent. on the net rental to form a risk and casualties fund, and 1 per cent. on the structural value to form a depreciation and renewal fund—together £160—which makes the expenditure £4961 10s. 11d., and deducting this from the £6546 7s. 2d., which I give as the income, leaves the true net annual profits £1584 16s. 3d. Capitalizing this at 20 years purchase (if the works are under Act of Parliament it is well understood that 20 years purchase is the principle to go upon, and if not, 16½), it gives as the purchase price £31,680 5s. From this I deduct for depreciation of buildings, plant, mains, and services, £2576, leaving the net sum to be paid for the undertaking by the corporation £28104.

Mr. HAWKSLEY: Do you mean that every gas-work, without reference to circumstances, and whether there is a large reserve-fund or not, and whether the dividend is backed up by a large property not brought into use or not, is to have exactly the same number of years purchase paid upon it?

Witness: The circumstances may alter the case. In this case I have put 20 years, but I have taken off a depreciation from the structural value, which is tantamount to reducing the number of years purchase by that amount. By regulating the depreciation on structural value, you can always provide for that 20 years purchase, supposing everything to be in good condition.

Mr. HAWKSLEY: That is not my question; but you have answered it by saying it varies by circumstances. That is all I meant to imply, because I wanted to know whether you considered it was a fixed rule without any reference to the state of the property.

Witness: You know that 20 years has been taken by gas engineers for some time past.

Mr. HAWKSLEY: As arbitrator I do not know it until I am told so; as an engineer I know it is not so.

Mr. CLERK: Have you ever known, in your experience, a greater number than 20 years given in an arbitration of this kind? Whether persons have given more voluntarily is another question.

Witness: No.

Mr. CLERK: You say that 20 years purchase ought to be always subject to depreciation to ascertain the state of the works at the time of sale?

Witness: Yes. I consider 20 years purchase is taken on the basis that the works are in a condition equal to new. If not they are subject to depreciation which reduces the figure in proportion to the condition of the works and the sum it would take to put the works in such a condition as new.

Mr. HAWKSLEY: Then you mean that this 20 years, with something downwards, is always the rule, but never with something upwards?

Witness: Yes, it may be, if there is a large reserve-fund, and that reserve fund is going to be handed over to the parties who purchase, then it is worth something more.

Mr. CLERK: There may be peculiar circumstances which would increase the value beyond 20 years purchase of the profits?

Witness: Yes, quite so.

Mr. CLERK: You went carefully into the accounts with Mr. Stevenson and other gentlemen, did you see anything in this case which would give more than 20 years value to the purchase?

Witness: No; I saw no special value. The position in which the works stand is sufficient for the purpose and no more. There is nothing special in the circumstances which I can see to increase their value.

Mr. LLOYD (in cross-examination): Let me clearly understand you take a per centage over an ascertained expenditure for four years—*i.e.*, you have applied that to what you say should be the income, and not that which has been the income. You get the cost per 1000 feet and apply that to £6546 7s. 2d., and not to the actual receipts of the company, £7141 12s. 2d.?

Witness: Yes.

Mr. LLOYD: Now, I see, in comparing your statement of expenditure with ours, you have coals £2610 16s., which is nearly £200 more than we actually paid last year.

Witness: That is from taking the average.

Mr. LLOYD: You have your purifying materials lower. How do you make the difference?

Witness: From their accounts.

Mr. LLOYD: But how have you got the per centage? This calculation you make is by applying a per centage to 1000 cubic feet of gas.

The UMPIRE: Pardon me, it is not so. He said distinctly that the £145 17s. 11d. for purifying material is the result of the expenditure over four years.

Mr. LLOYD: And then he goes on further.

Mr. CAWLEY: The decimal figure, which is his multiplier, is the result of the four years, and to bring out the £145 17s. 11d. he applies that to the 23,812,000 feet of gas made last year.

Mr. LLOYD: It is not the actual amount you find has been expended in the four years, but a rule applied to a certain make which brings out that figure?

Witness: Yes; I could not take the average of coal for four years because the average would be a smaller amount than this, but I take the average cost per 1000 cubic feet of gas, and multiply the quantity of gas sold last year, and I get an amount which, supposing the four years working had been put together, and the quantity of gas sold in each year had been the same, would have brought out this figure; but inasmuch as the cost of coal has been more in previous years than the last year, the result given is greater than the actual sum of money expended last year.

Mr. HAWKSLEY: Does not that lead to the inquiry whether the price of coal last year was a fair price, because, as it appears to me, the company might be in a better position to get their coals, which would tend to reduce the cost, and the company might have made less gas per ton of coal, which would again alter your figure.

Witness: I have not gone into the actual circumstances which caused coal to be higher in 1867-68. In 1867-68 the coals cost 2s. 2·8d. per 1000 cubic feet; in 1868-69 they cost 2s. 2·6d.; in 1869-70 they cost 2s. 2·1d.; and in 1870-71, 2s. 2·87d. I add these four together, divide by four, and multiply by 23,812,000.

Mr. LLOYD: I understand the prestidigitation. There has been a considerable increase in the make of gas you understand. Now, in your statement, the amount put down for wages is £651 17s. 2d., but the actual amount paid last year was £455 10s. 1d., although the make was greater than in the previous year.

Mr. CAWLEY: Your wages are £601 18s. 10d. when added together.

Mr. LLOYD: Well, that is £50 less, so that wages upon the largest make that has ever been are less than witness makes them. We have been increasing our make 20 per cent. for each of the four years, and yet he makes the wages more upon the average than they were in the last year.

Witness: It is the average cost per 1000 cubic feet of gas.

Mr. LLOYD: That is just the fallacy. It shows what absurdities you get into by adopting this system. Your "Salaries, discounts, &c.," are £438 10s. 9d. Our "Salaries" were £347 4s. 10d. What do you mean by "discounts"?

Witness: Discounts taken off the gas.

Mr. LLOYD: Surely, if you take our return absolutely, which is ex. discounts, why do you introduce this again as a charge?

Mr. MICHAEL: Ours is the net rental with the discount taken off.

Mr. LLOYD: Just follow me to the next item, "Rents, rates, and taxes." You make a higher figure than we actually paid last year. We paid £171 7s. 2d. You have put down £227 4s. 1d.; that surely cannot be an average taken from our books, it is impossible.

Witness: Yes, it is.

Mr. HAWKSLEY: It arises from the fact that the taxes were pretty nearly the same when the make of gas was smaller; and, therefore, deducing anything from averages under these circumstances, is fallacious.

Mr. LLOYD: It is impossible that there can be higher rates on the average of four years than we paid last year, and yet he makes it so; it is £227 against £171. Have you put the income-tax in?

Mr. HAWKSLEY: I may just mention this. The same company making a small quantity of gas at the commencement will make it at a cost of, say, 3s. per 1000, but when they come to be a larger company they can possibly make it at 1s. 10d. This is all done by the extension of the quantity made not expanding the constant charges. How absurd it would be to make an average between 3s. and 1s. 10d., which is in fact done in this way by the witness. If this were not an increasing concern, the average principle would be right; but this is a progressive concern, and the average taken in this case cannot bring out a right result.

Mr. LLOYD: You make the expenditure upon coal £2610, whereas in fact last year it was £2439, when there was the greatest manufacture. In your judgment would it have been fair, supposing the price of coal had been higher in two or three years and lower afterwards, to take the highest only, or to include the whole?

Witness: Last year happens to be the lowest, with the largest make.

Mr. MICHAEL: Your facts are quite wrong; coals were dearer last year. We have that in evidence.

Mr. LLOYD: What have you taken as the structural value upon which you claim depreciation?

Witness: Upon £20,000, less any parts that are not depreciable.

Mr. LLOYD: You take off depreciation on the ground that it is necessary to have a reserve to keep the property up to its original value?

Witness: Yes.

Mr. LLOYD: Then what is the use of a reserve-fund?

Witness: This is a reserve-fund.

Mr. LLOYD: Do you know the price of gas in the Isle of Wight? Take Newport?

Witness: No, I do not.

Mr. LLOYD: There are Newport, Ventnor, and Cowes. Have you ascertained what is the price of gas in any one of those places?

Witness: No, I have not.

Mr. LLOYD: Have you not heard that at Newport it is 5s., at Ventnor 5s. 10d. and at Cowes 5s. 10d.?

Witness: I did not make any inquiry. There were certain returns made of

towns which a previous witness wished to put in, but the arbitrators thought they were not admissible, and it was upon those returns I based my statement.

Mr. LLOYD: But you gave it as a reason why there should be a reduction at this place?

Witness: No; the other towns are smaller.

Mr. CAWLEY: What was the divisor you used as representing the quantity of cubic feet of gas sold?

Witness: The divisor is the quantity of gas sold as taken from the books of the company, with an estimated consumption of gas for the public lamps. I have taken Mr. Stevenson's figures for the latter.

Re-examined by Mr. CLERK: Coals are increasing in price very much this year, and are likely to go up considerably. Last year was a favourable year in that respect. The company require to have a depreciation-fund, because that which produces them profit is constantly decreasing in value, and is subject to casualties. A reserve-fund is available for this purpose, and also for keeping up the maximum dividend.

Mr. CLERK: But it is not a capital fund to replace works.

Witness: Yes; where no dividend has to be paid. When the works are in the hands of the corporation it will only be to keep up the works.

Mr. LLOYD: Your estimate of depreciation is what it would be when passed over to the corporation.

Witness: Yes; in the hands of the corporation. I should think more than 1 per cent. would be required if in the hands of the company. I should estimate it then at 1½ per cent.

Mr. CLERK: Why 1½ per cent. in the hands of the company?

Witness: It would be to meet deficiencies in dividend. It is a reserve-fund altogether. I do not know any difference between depreciation and reserve.

Mr. HAWKSLEY: But if the corporation do not pay dividend they pay interest.

Witness: But corporations have different powers to companies in regulating the price of gas to meet the interest on their capital. They do not pay 10 per cent. like a company, and every £1000 they call up they do not call up at 10 per cent., but at what they can borrow it for.

Mr. HAWKSLEY: But how does that alter the reserve-fund? An accident would be exactly the same; but if I understand your answer rightly a corporation would immediately vary the price of gas or cast the cost upon the rates. Why do you make a difference between a company and a corporation?

Witness: Because a corporation do not require to pay a large dividend; they pay a much smaller interest. They can pay their interest with a smaller profit, and the consumers get gas at a less price, and they know that if there is a deficiency in the interest it must be made good by an increase in the price of gas.

Mr. HAWKSLEY: Is it not the same thing in fact?

Witness: Perhaps it is if a company could do it.

Mr. CAWLEY: A corporation would divide the profits year by year, and not have to equalize them as a company would want to do.

Mr. HAWKSLEY: But a company could conduct their business exactly in the same way if they chose to make that kind of fluctuation, and would no more require a reserve-fund than a corporation.

Witness: No; but as a rule they like to keep their dividends equal, and if there is a deficiency in one year they call upon the fund in hand to make it up, replacing the amount next year if there is an excess. They require something in excess of what is needful for depreciation and accident to plant.

Mr. HAWKSLEY: I want to know what that something is—what it is applicable to?

Witness: Applicable to equalize the dividends and meet extraordinary casualties.

Mr. HAWKSLEY: But that is the statutory reserve-fund.

Witness: Yes.

Mr. HAWKSLEY: But why do you make that, if it is the object of the statutory reserve-fund, which is to be made out of the excess of profits after all dividends have been paid—how does it become an annual charge upon the profits?

Witness: You must take it out of the profits.

Mr. HAWKSLEY: I cannot understand why this £160 is deducted from the profits?

Witness: It must be taken from the profits.

Mr. CAWLEY: I can tell you afterwards, but not now.

Mr. HAWKSLEY: But this is matter of inquiry now. When you and I sit together there will be no evidence.

Mr. CAWLEY: The witness cannot give an answer without putting a construction upon an Act of Parliament.

Mr. HAWKSLEY: Supposing it is a charge upon the reserve-fund, and the reserve-fund is to be made out of the excess of profits, why do you deduct £160 from the annual net profit?

Mr. CAWLEY: It is a question which has been long since answered. I am not inclined to be so thin-skinned as you are, but every man in the room knows from which side most of the interruption comes. You have now been asking him questions for a quarter of an hour upon that which is not in his estimate at all.

Mr. HAWKSLEY: Surely the £160 is.

Mr. CAWLEY: No; the £160 is put to maintain the works, and you are now asking him why he puts it to the reserve-fund.

Mr. HAWKSLEY: No; it is the very thing which can be taken out of the reserve-fund.

Mr. CAWLEY: I tell you, with all this provocation I am not going to be driven to answer now; but the answer is quite plain.

Mr. HAWKSLEY: Surely it is my duty to hear what the witness says.

Mr. CAWLEY: Quite so; but the questions now being put are far more apart from the question in issue than ever.

Mr. HAWKSLEY: The witness has said this thing, and here it stands—"Depreciation and renewal fund, 1 per cent., structural value." If a thing wants renewing, and the reserve-fund is available for that purpose, it can be renewed from that, and then you increase the reserve-fund again.

Mr. CAWLEY: But you must have the reserve-fund first.

Mr. HAWKSLEY: That is not the question I am putting to the witness; but I will not carry it farther, for it is perfectly obvious I cannot with these interruptions get at the thing I want.

Mr. LLOYD: The witness says himself it is in the nature of a reserve-fund, and then Mr. Hawksley says, "Why do you want it?"

The UMPIRE (to witness): What do you say about the land? Is it to be valued and paid for to the company?

Witness: Yes; the value of the land outside the works is to be added to the figures of mine.

The UMPIRE: Just tell me this—you have given 20 years purchase upon a net annual profit of £1584. The capital of the company is £31,000 odd. If you deduct the vacant land it would leave about £26,000, and that would make your net annual profit about 6 per cent. all round?

Witness: Yes.

The UMPIRE: Without any reserve-fund except the accumulation of the £160?

Witness: Yes.

The UMPIRE: Then you say, a company not paying by a good deal their maximum dividend, and having in point of fact little or no reserve-fund—say no reserve-fund—is worth 20 years purchase?

Witness: Yes, put into condition.

The UMPIRE: Then under the same state of circumstances and condition of structure, with a company paying the maximum dividend, and having a reserve-fund, say 5 per cent. upon the capital, how many years purchase ought that to be worth, if the other is worth 20 years? Because in the one case you are only getting a small dividend without a reserve-fund, in the other you are getting the maximum dividend and a respectable reserve-fund, so that you may rely upon the dividends being equalized.

Witness: In this case they paid the full maximum dividend last year.

The UMPIRE: I am only putting an abstract proposition.

Witness: If it appeared a concern not likely to pay the full maximum dividend, I should consider 20 years purchase too much; but all gas companies, in my experience, properly managed and fully developed do and will pay and maintain their full maximum dividend, and I see no reason to take an exception in this case.

The UMPIRE: I do not ask about this case. I want you to take the most favourable case you can of a gas-work—an incorporated gas-work—can you imagine, or according to your experience have you calculated upon getting a higher rate than 20 years purchase?

Witness: No.

The UMPIRE: Have you ever known it given?

Witness: No.

The UMPIRE: Under no circumstances?

Witness: No, I have never known it.

The UMPIRE: Not by private arrangement?

Witness: Perhaps by private arrangement we might have obtained a higher value than that, but it has been under peculiar circumstances—there has been something favourable in the case that has induced the party to give a larger price. But I cannot tell, and I do not know whether a higher estimate than 20 years has ever been made. I should not be disposed, under any circumstances, to give more than 20 years. With regard to the reserve-fund, that should be purchased with the 20 years, and handed over as part of the stock and capital of the company.

The UMPIRE: Going with the retorts?

Witness: Yes.

Mr. HAWKSLEY: Are you aware of the terms of the four or five recent sales?

Witness: I cannot charge my memory.

Mr. HAWKSLEY: Then are we to take it you are speaking without knowledge of the actual facts? Have you ascertained in any way the terms of the four or five recent sales within the last twelve months?

The UMPIRE: Of private companies?

Mr. HAWKSLEY: Private and statutory companies as well.

Mr. RICHARDS: Would it not be better to mention names?

Mr. HAWKSLEY: I will do it with pleasure, but I thought you would object. I will give you the one company at Rotherham, two companies at Leeds, one at Huddersfield, and one at Bolton.

Witness: No, I do not.

Mr. CAWLEY: As I understand it, you have given us in this case 20 years, not upon the maximum dividend, but upon what you estimate would be a perfectly maintainable dividend?

Witness: Yes, taking the average of the last four years.

Mr. LLOYD: There is £11,900 gone at once by taking off the 6d. per 1000 cubic feet.

Mr. HAWKSLEY: There is one other question I should like to ask. Suppose the price of gas were lowered, is it not usually the effect that there is a greatly increased sale?

Witness: It is.

Mr. HAWKSLEY: Does not that greatly increased sale restore the profits?

Witness: You want me to speak generally?

Mr. HAWKSLEY: Yes.

Witness: To a very large extent.

Mr. CAWLEY: Somewhat depending upon the nature of the towns.

Witness: I find, in the course of years, that the highest profits are reached?

Mr. *Robert Jones*, examined by Mr. RICHARDS.

I have been for nearly 20 years engineer of the Commercial Gas Company, and have been consulting engineer to several provincial gas companies. I have examined the Ryde Gas-Works, and investigated the accounts of the company.

Mr. RICHARDS: Are you of opinion that the company should be paid upon a valuation of their earnings, and on the capital actually expended on the works?

Witness: Yes.

Mr. RICHARDS: What do you take to be the maintainable selling price of gas at Ryde?

Witness: 4s. 6d.

Mr. RICHARDS: And the actual capital expended at the works you take at——

Witness: £23,000. Excluding the loss of the land I divide that into £18,750, representing the old capital at 9 per cent., amounting to £1687 10s., and the balance of new capital £4250, at 7 per cent., amounting to £297 10s. a year. The dividend, therefore, upon the total capital expended in the works is £1985, which, at 20 years purchase, amounts to £39,700. I do not enter into the question whether it should be 20 or 16⅔ years. From the £39,700 I deduct for depreciation of works and plant £2576, leaving as the real value of the undertaking £37,124.

Mr. RICHARDS: Whether it should be 20 or 16⅔ years you do not say?

Mr. LLOYD: None of the witnesses have estimated upon the 16⅔.

Mr. HAWKSLEY: I merely instanced the 16⅔ and 20 as the ratio between the value of a statutory and a non-statutory company, but it is only a ratio, and you may apply that to any number of years purchase you please. You may take it as at Bradford, at 38 years; and if it were a non-statutory company, you would have to multiply by 16⅔ and divide by 20.

Mr. RICHARDS: It is a ratio subject to circumstances. In the particular instance of Ryde do you see any circumstances which lead to any variation in the usual calculation?

Witness: No; I have taken Ryde as at 20 years.

Mr. RICHARDS: Do you express an opinion one way or another about the company being incorporated?

Witness: No, I do not.

Mr. LLOYD: He knows it to be an incorporated company?

Mr. RICHARDS: No; that is a legal question, and the witness knows nothing at all about it.

Mr. LLOYD: He assumes it to be, or he would not put 20 years purchase on it.

Mr. RICHARDS: Now, something has been said about 20 years not being a binding rule; it obviously varies with circumstances?

Witness: It does.

Mr. RICHARDS: I think in the case of Huddersfield you yourself were engaged?

Witness: Yes.

Mr. RICHARDS: There more than 20 years was given?

Witness: Yes.

Mr. HAWKSLEY: That is all that I, sitting here as an arbitrator, want to know. Sometimes it must be more.

Witness: They had 24 years purchase of their statutory dividends, but that was a very different thing to this.

Mr. RICHARDS: With regard to the scrubbing and condensing apparatus at Ryde, did you form any opinion as to that being sufficient as compared with the power of the retorts?

Witness: I considered it inadequate.

Mr. RICHARDS: And the leading mains?

Witness: Very much below what they should be for present purposes.

Mr. RICHARDS: *A fortiori* for any extensions. But you did not go into the question of what is necessary to be expended in detail to raise the scrubbing and condensing power to a par with the retorts. Can you give us any idea about it?

Witness: I should substitute new scrubbing and condensing power, and I should take up a considerable quantity of the leading mains and increase their size very much. I have an opinion that it would cost from £2500 to £3000. That expenditure would put the works in a position commensurate with the retorts.

Mr. HAWKSLEY: But I understood the evidence to be that the purifying power is in excess.

Witness: Yes.

Mr. HAWKSLEY: What is the effect of the scrubbing and condensing power being too small?

Witness: I tested the gas at the hotel where I stopped, and I found that it readily and very quickly discoloured turmeric paper, showing that it contained a large amount of ammonia.

Mr. HAWKSLEY: Then how about condensing?

Witness: I take the loss by leakage, being 18 per cent., as representing imperfect scrubbing, as also indicating the condition of the mains.

Mr. HAWKSLEY: Then, supposing it is so, it increases the cost of manufacturing proportionately.

Witness: No doubt it does. I believe if new scrubbers were put in, the cost of manufacture would be diminished and the profits greater. In this case, I am valuing the earnings of the company—the full statutory dividend upon their capital laid out in works.

Mr. HAWKSLEY: But that is not quite my question. Supposing the company had put in these new condensers and scrubbers, they would have been able to make gas at a less price.

Witness: They would be able to make a purer gas.

Mr. HAWKSLEY: And at a less price?

Witness: Yes.

Mr. HAWKSLEY: Then there would be a larger profit from the manufacture of gas.

Witness: No doubt.

Mr. HAWKSLEY: And if they had the command of that larger profit, it would have to be multiplied by 20 years purchase. Would not that reproduce those scrubbers and condensers for which you are proposing to make a reduction?

Mr. CAWLEY: Mr. Hawksley means this: if you put in increased condensers and purifiers, would not the additional profit pay the cost of putting them in?

Witness: Yes, in the course of time.

Cross-examined by Mr. MICHAEL: I take the leakage at 18 per cent. on the quantity of gas made and sold. I take the gas made to be 29,103,000 cubic feet, and the gas sold by meter at 23,812,000.

Mr. HAWKSLEY: But the same argument applies to this. If there were less leakage there would be more profit.

Cross-examination continued: I have taken the private consumption to be 20,776,000, and the public lights 3,036,000. The public lights are calculated at a consumption of 3300 hours, being 5 feet per lamp for 11 hours a night. The consumption by the town clock is not included. It only amounts to £18 per annum, and is therefore a very small affair.

Mr. HAWKSLEY: But the evidence was that the £18 was not an adequate remuneration, and did not represent the consumption. But after all it makes no difference, the profits are the same. We are going upon the basis of profits, and whether the unaccounted-for gas is 13 or 18 per cent. is immaterial, because we are taking the profits on the gas sold and paid for.

Mr. CLERK said a question respecting the value of the land had been raised by the evidence gone into by the company, although, according to his view of the case, it would be quite immaterial.

Mr. LLOYD: You mean to leave it to us? You will not take it without paying for it?

Mr. CLERK: We shall show that, according to our view, we have paid for it all.

The UMPIRE: The witnesses you have already presented have not assumed that. They say their estimate is based upon the capital expended on the works.

Mr. CLERK: It will depend upon the view you ultimately take, and therefore we give you evidence.

Mr. *F. Newman*, examined by Mr. CLERK.

I reside at Ryde, and have been surveyor to the Ryde Commissioners and the corporation from the passing of the Act of 1854. I was employed in 1864-65 by the Guardians of the Poor of the Isle of Wight Union to make a valuation of the whole of the parish of Newchurch, which comprehends very nearly the whole of the town of Ryde and the town of Ventnor, and a large rural district beside. I am well acquainted with the value of land and buildings in the borough of Ryde, particularly in the neighbourhood of the gas-works, because I have lately been employed by the pier company to value land for the line of railway which passes the north side of the works. I have made a careful survey of that portion of the property of the company which does not form part of their works, which I estimate to be worth £3267 10s. I do not consider that any portion, except that fronting Monckton Street, is available for buildings except of a low class. The utmost such land would fetch is 2s. a foot frontage, with a depth of 100 feet. The bye-laws of the Ryde Local Board would prevent the laying out of the land as proposed by the company's witnesses for roads, &c., because of the insufficiency of the depth. There is not much disposition to build small and cheap cottages in Ryde. The value of the land on which the works stand I estimate to be £1265 12s. 6d., being at the rate of £750 per acre.

Cross-examined by Mr. LLOYD: There have been many dealings with land of late years at Ryde. I have taken the value of this land as ordinary building land in such a situation. I have not taken the value of the land outside the works on an estimate of what it might be worth for gas-making purposes. I think there would be no difficulty in getting an adjoining site for gas-works at £500 per acre. The effect of erecting gas-works in a locality is to diminish the value of land there. These works have been established 30 years, and land could be purchased now at a much less price than this was originally bought for. I am aware that the price I have put on this land is about £1800 less than the company gave for it. Assuming that the road proposed by the plaintiff's witnesses might be made of a width of 20 feet, there would be abundance of room. The right of the company to have a siding from the railway adds to the value of the land. I take it that it will be 14 years before the company require any of the adjoining land for their manufacturing purposes, and then it would be more valuable to them. The increase in the manufacture of gas has lately been 4 per cent. per annum. In 1868 it was 25,208,068 cubic feet; in 1869 it was 26,563,000; and in 1870 it was 27,163,000. Deducting the make in 1868 from that in 1870 the difference is 1,955,000, which is about 8 per cent. for the two years, or 4 per cent. per annum. From 1868 to 1869 the increase was 5 per cent.; from 1866 to 1867 it was 4 per cent. I have not worked out the increase in 1870-71.

Mr. HAWKSLEY: Was not the increase nearly 7 per cent.?

Witness: Not in the figures I saw.

Mr. HAWKSLEY: Supposing the land to be used for gas purposes, would you discount it by 14 years?

Witness: The way I worked it out was this: at 5 per cent. money doubles itself in 14 years; therefore, if the land is worth £200 now, it would be worth £400 in 14 years.

Mr. HAWKSLEY: But what would be its worth in 14 years?

Witness: It amounts to the same thing.

Mr. HAWKSLEY: No; you, as I understand, take the existing value at 14 years hence, and then you say, taking that value at 14 years, the present value must be half that in order that the half may become the whole in 14 years, but that is adding nothing for enhancement of value in the 14 years.

Mr. CAWLEY: But he says, if it is to be dealt with now, it will be worth double the value before they want it.

Mr. LLOYD: Do you think the gas company did wisely in converting their leasehold into freehold?

Witness: I am not fully informed of the circumstances. I was told that they ran the risk of forfeiting their lease for building without consent. But I have not valued the conduct of the managers. It appears to me that the land has cost them a very large sum; I cannot tell what influenced them.

Mr. HAWKSLEY: You do not know what influenced Parliament to authorize them to do so?

Witness: No.

Mr. CAWLEY: Parliament never undertakes to decide the question whether the price to be paid by a party is reasonable or not.

Re-examined by Mr. CLERK: I considered it would be so long before the company would require to make use of the land coloured green on the plan, that I have not taken that as forming part of the gas premises into my calculation. I do not think the frontage to the railway can be made available for commercial purposes at the present time. A large portion of it is not fit for building, and the requirement for yards abutting on the railway is limited, there being other land nearer the town suitable for that purpose.

Mr. *Thomas Hollier*, examined by Mr. RICHARDS.

I am an architect and surveyor residing at Ryde, and have carried on business there for the last 36 years. I have frequently been employed to value land and houses in the borough. I know the property of the company. I have valued the whole of the land beyond the curtilage of the works at £3346 5s. I give 4s. per foot for the frontage in Monckton Street.

Cross-examined by Mr. MICHAEL: I have not made any estimate of the value of the land upon which the works stand.

Mr. *V. R. Martin*, examined by Mr. CLERK.

I am an auctioneer and valuer at Ryde. My firm sold to the gas company the whole of the property marked on the plan, with the exception of the portion coloured red. I value that part which is not occupied by the works at £3197 19s. 6d. I agree with the other witnesses as to the value of property in Ryde.

Cross-examined by Mr. MICHAEL: I have not valued the site of the works.

Mr. RICHARDS proposed to call a policeman of Ryde to give evidence as to the number of hours during which the public lamps were lighted.

Mr. LLOYD: You may swear him if you like, but I object to this evidence.

Mr. RICHARDS: We tender him. He is a police constable in the borough of Ryde, and it is part of his duty to take note of the time the lamps are extinguished and lighted, and also to report to his employers any complaints as to the state of the lights during the night. He will produce a book, the nature of which is obvious from what I have stated, and I apprehend it is perfectly good evidence to support us in the allegation that the lights alleged to burn 12 hours do not, in fact, average more than 11 hours.

Mr. HAWKSLEY: Does he go every night to see?

Mr. MICHAEL: How can this witness tell when all the lamps are lighted and extinguished?

Mr. CAWLEY: That is a question of credibility.

Mr. LLOYD: But is it worth while to prove, even if you could do it?

Mr. RICHARDS: Not if you admit 11 hours.

Mr. CAWLEY: It only goes to the question of the time of lighting.

Mr. RICHARDS: If they will admit, as a fact, that 11 hours is near the mark——

Mr. LLOYD: Whether it is 11 or 12 hours does not make the difference of one brass farthing in this inquiry. It only affects this question—they say the amount of unaccounted-for gas is 18 per cent., we say it is 13.

Mr. CLERK: A great deal has been said about the quantity of gas consumed by the public lamps; they are said to average 12 hours a night.

Mr. MICHAEL: That is the contract.

Mr. RICHARDS: We distinctly say they do not perform their contract.

Mr. MICHAEL: You do not put in any complaints.

Mr. RICHARDS: I am told that complaints are constantly being made.

Mr. HAWKSLEY: Are they made to the gas company?

Mr. MICHAEL: They ought to produce them if they are.

Mr. CAWLEY: What strikes me is this—if we were fighting the question whether you performed your contract or not, their point would be a good one. I am very much inclined to take Mr. Lloyd's view, that this is unnecessary, and does not touch upon the present question.

Mr. LLOYD: Whether the lamps are lighted for 11 or 12 hours does not touch the question of the value of the works.

The UMPIRE: I apprehend it is to show that the mains and services are not in good order, and that there is very little leakage.

Mr. RICHARDS: It really does affect the question of unaccounted-for gas.

Mr. HAWKSLEY: On the other hand I would submit that if less gas were made, and the mains were not in a bad state, there would be larger profits, and then, instead of being worth what they now claim, they would be worth so much more, so that I do not see really how it affects the question.

Mr. RICHARDS: I do not know that I am prepared seriously to say it does affect the question except that they have constantly flaunted in our faces the accuracy with which they perform their contract, and that the lamps are lighted for 12 hours a night. We have the man here who takes down the thing, and who will give you period after period during which the lamps in whole streets have been begun to be put out long before sunrise.

Mr. HAWKSLEY: It comes to nothing, because no mortal man (unless you burn by meter) can tell how much gas is consumed per hour. It is all very pleasant for us, who are gas engineers, to know what the leakage is, but it will not alter the ultimate value of the undertaking, which is based upon the profits.

(*To be continued.*)

WORSHIP STREET POLICE COURT.—MONDAY, JAN. 1.

(*Before Mr.* HANNAY.)

A complaint having been made to the magistrate at this court against the East London Water-Works Company, Mr. Hannay suggested that the secretary of the company should attend before him so as to hear the complaint, and then make any answer he desired. In that manner the complaint would not be *ex parte*.

The SECRETARY accordingly attended this day, and the applicant re-stated the nature of his complaint against the company.

The APPLICANT stated that he was a builder, having house property in the neighbourhood of Stratford, and some time ago one of his tenants left, being at the time three quarters in debt for water-rates to the East London Water Company. In consequence of this the supply was cut off. Recently the house had been re-let, but the new tenant was not supplied with water, although he had paid a quarter's rate in advance as security. The company demanded now a further sum of 5*s.* for turning on the water, which would take them about five minutes.

The SECRETARY said that in new houses water-works companies were constantly being defrauded of their rates by the tenants decamping.

Mr. HANNAY said that the complaint was made under the 48th section of the

Act, which made it obligatory upon a company to supply an incoming tenant notwithstanding arrears for water by an outgoing tenant. The allegation was that they demanded 5s. for turning on the water.

The SECRETARY said that was not so. When the supply was cut off on the disappearance of the tenant the pipes were disconnected, and the 5s. was for the expense of opening the ground and making the re-communication. The secretary called the attention of the magistrate to the private Act of the company embodying this provision. He further pointed out that another section of the Act provided that persons might get the work of re-communication done at their own expense by giving three days notice as to the opening of the ground.

The APPLICANT wished to know what was the custom of the company as to supplying new houses.

The SECRETARY replied that they always charged for laying the pipes.

The APPLICANT said that recently he had had new houses supplied without charge.

Mr. HANNAY remarked that he had in that instance much to be thankful for. It was impossible for him to help the applicant, for it appeared that the company were entitled to demand what they did for making the re-communication.

The APPLICANT said that the communication was in existence, and had never been destroyed.

Mr. HANNAY said that other than as an application the matter was not before him. If applicant chose to take out a summons and prove his case he could do so. He had thought to save him trouble and expense by getting the secretary to attend. At the same time, he had guarded himself against expressing an opinion upon the matter, as he knew companies generally had local or private Acts providing for every contingency.

The SECRETARY thanked Mr. Hannay for his courtesy, and the parties retired.

Miscellaneous News.

ADDRESS OF THOMAS HAWKSLEY, Esq.,

PRESIDENT OF THE INSTITUTION OF CIVIL ENGINEERS,

On taking the chair, for the first time, after his election, Jan. 9, 1872.

Gentlemen,—In accordance with the long-established usage of this institution, I have now the privilege of addressing you from the chair to which you have done me the honour to elect me. I purpose, therefore, to avail myself of this opportunity to place before you a condensed survey of the more prominent of the numerous results of engineering skill by which the period of office of your distinguished and veteran ex-president has been rendered remarkable.

But before proceeding to the customary business of the evening, allow me to discharge with heartfelt satisfaction the most agreeable duty of congratulating the assembled members of this institution on the providential restoration of His Royal Highness the Prince of Wales to a state of apparently assured recovery from that imminent danger by which, one short month ago, the life of His Royal Highness was hourly threatened. On no other occasion has the nation manifested so unequivocally and so unanimously its entire sympathy with and for our beloved Queen, and with and for that estimable lady, the Consort of His Royal Highness. It will be a lasting satisfaction to us that by a solemn adjournment of our usual meeting we recorded, in the only way open to us, our sorrowful appreciation of the magnitude and gravity of what then appeared to be an impending national calamity.

You will not need to be reminded that in this comparatively short interval we have seen a powerful nation, our friends and neighbours, all but crushed in one of the most fearful struggles the world has ever witnessed in ancient or modern times. I believe, indeed, that history records no similar instance in which, in the course of a few months, so many armies entered into conflict, so many sanguinary battles were fought, so many fortified places of great strength were reduced; and, finally, in which the capital of a nation of nearly 40,000,000 people became invested by 250,000 soldiers, and was at length compelled to capitulate, if not by the direct force of arms, at all events by the necessities which the exclusion of the supply of food enabled the victors to impose upon the vanquished. With the political situation of Europe immediately previous to the outbreak of hostilities, or with the altered and still uncertain political situation of the Continent as it now prevents itself, however interesting and important the study of these conditions must be to all far-seeing and patriotic Englishmen, we in this hall have no concern. Still, knowing as we do, and as the world at large knows too well, that the momentous events of which we—happily for ourselves—have been the passive spectators, were accomplished, not more by the peculiar military organization of one of the belligerents than by the superior manner and extent to which that belligerent had, by previous preparation and by sudden application, utilized the art and resources of the engineer—it is impossible to conceal from ourselves that the disasters which have befallen our neighbours may, in turn, befall us, unless, indeed, we accept the warning, and prepare ourselves against them. I feel, therefore, under no restraint in expressing from this chair the distinct opinion, and the warning it may be, that the future safety, and possibly also the national existence of this kingdom, will depend upon the judicious, wise, and far-seeing policy with which the Government of the day, and of every day, shall be guided to the timely and effectual efforts to avail itself, for the purposes of national defence, of the devising and constructing ability of our experienced and practical profession. The recent conflicts in Russia, Denmark, Italy, America, Austria, and France have taught us that the wars of the 19th century have been equally remarkable for the suddenness with which they have been commenced, and for the rapidity with which they have been carried on to a termination most sad and disastrous to one, if not to both the contending parties; and we have learnt that, in the case of otherwise equally matched antagonists, the victory has been realized by the combatant that was the best provided with the weapons and munitions which, notwithstanding the existence of Government arsenals, had been devised in, and had been largely drawn from the offices and workshops of the non-military engineer.

Nor can we exclude from our convictions that nations have latterly become relatively smaller exactly as the means of locomotion and the facilities for the exchange of ideas provided by the engineer have become relatively greater, and that consequently there has for some time past existed a general tendency to the disappearance of the minor states by their absorption into the already major nationalities. A powerful neighbour will indeed always covet, and will generally find or invent an occasion for acquiring, the Naboth's vineyard of his own immediate locality, especially since the abandonment of the once accepted doctrine that the maintenance of the balance of power was a common duty of friendly nations.

Now, discrediting as I do the popular notion that England is invincibly strong within, and that her "streak of silver sea" is sufficient for her effectual protection from without; and seeing, too, that her people are seriously dependent on other and distant countries for their daily supply of food, and equally so for their employment in the manufacture of exchangeable commodities, I venture to ask myself whether the engineering skill and resources of this country have been sufficiently availed of for the defence of our coasts and for the maintenance of our undoubtedly needful power at sea. Looking at the question from an entirely non-aggressive stand-point, and with the fullest desire to discountenance any wasteful expenditure of public money, I am nevertheless compelled to answer to myself in the negative; for, although it may be admitted that we have of late accomplished something valuable by way of instalment for the defence of our hearths and homes, and that we are still prosecuting this good work in a hesitating and perfunctory manner, and that we may at some future day, if we be let alone long enough, bring the operation well nigh to an end, yet I think you will all agree with me that the means of protecting our distant colonies, and of securing the safety of our world-wide commerce, without which commercial and manufacturing England is nothing, do not at this moment exist. We have, with the best intentions, expended much time and millions of money in creating a navy chiefly consisting of colossal and heavily-armoured ships, which (whatever may be their other and probably very valuable properties) are for the most part fair-weather sailers, which are in general incapable of carrying fuel for a prolonged voyage, and still less for a Nelsonian cruise, and which, by reason of their great draught, can enter but a small portion of the number of the harbours of the world, or indeed of those of our own country.

The articles so much needed could, however, be well furnished by the combined efforts of our numerous engineers, ship-builders, and machinists, in any quantity, but not, as many assume, at any moment, provided the opportunity were afforded by the prudent withdrawal of those official, and, it may even be, parliamentary impediments by which the way to the speedy attainment of so grand an object as the establishment of an effective oceanic police is now barred. These impediments are, undoubtedly, based on a preference for official designs and official manufacture, and, however well intentioned, implicitly signify that the talent centred in a Government department is, in official estimation, more skilled and more capable than that which is to be found amongst the thousands of able men who have not been drawn within the magic circle of official life.

The numerous ships which have distinguished themselves by their speed, their seaworthiness, their capability of making and sustaining the strain of long voyages and of encountering the vicissitudes of weather and climate, not to say of occasionally undertaking warlike operations, are all the work of private builders; amongst such ships are the steamers which habitually run to the Mediterranean, to the East and West Indies, to New York, and even to Australia; and to these might be added the clever blockade runners and the wicked *Alabama*. Can our navy boast of appropriately modified equivalents of these types?

Towards the proper construction of a Floating Policeman, I venture to suggest that the members of the institution interested in this question should direct their attention to the best means of obtaining the following four essential properties (amongst others which will readily suggest themselves):—First, a moderate draught; second, great stability; third, a high speed when under steam; and fourth, a competent stowage for fuel. These qualifications are not inconsistent; but a heavy armouring would, I think, be incompatible and unsuited to the purposes to which such ships would in time of war be applied—namely, those of protecting our colonies, of convoying our merchantmen, and of scouring from the seas the ships of our enemies. For home service they would be equally useful, as it is obvious that few, if any, large armour-plated vessels could successfully withstand the attack of a cloud of rapidly moving sea hornets, each one armed with a single heavy gun.

With such a fleet, and the means which the genius of your members of council, Sir William Armstrong and Sir Joseph Whitworth, not to mention others, have placed at the nation's disposal, our citizens would feel safe and happy at home, whilst the nation would command that respect which continental governments and continental peoples never accord to the "barking dog that cannot bite."

For these reasons I should welcome the production, at the meetings of this institution, of any practical papers containing such information pertinent to this subject as will lead to an intelligent and temperate discussion of the most suitable forms and arrangements for ships of war, and for their steam machinery and propelling apparatus, and for the implements and munitions with which such ships ought to be provided and armed. In no way, as it appears to me, could this institution at the present juncture serve its country better, or better promote, in the interests of peace, the advancement of practical science, and its application, if events should order, to the purposes of protective warfare.

Of the military constructions which have been erected in defence of the national arsenals, it is not my intention to speak further than to record with satisfaction the exceptional circumstance that your past president, Mr. Hawkshaw, was called in to assist the military authorities, and has devised, amongst other matters, a system of plating with wrought iron, so ponderous and so securely combined, that it is believed the heaviest shot fired from an enemy's ship will be unable to tell destructively upon any fort thus protected. It may, however, be remarked that most of our commercial seaports are, at least, as much exposed to an enemy's operations as are the arsenals, and that, unless these can be effectively protected by a fleet, it will become necessary to erect and maintain a considerable number of such superior land batteries as will keep the enemy's ships beyond bombarding range. The enormous expense of these immovable works, and the obvious objection that a seaport town presents a mark of great magnitude, and therefore a mark easy to hit, whilst a moving vessel, attacking from a distance of three miles or more, presents a mark small and exceedingly difficult to hit, render any project of this kind comparatively infeasible, if not altogether useless.

In making these observations I am, however, not unaware that many persons are impressed with the notion that in future war will be conducted on such chivalric principles that undefended forts and property will be generously spared by an enemy's forces. I do not concur in this view, nor do I conceive that, so long as it remains an object of war to cripple an enemy's means, and so reduce him to a speedy submission, it would be prudent for England to rely for the safety of its ports on the forbearing generosity of a vigorous and determined antagonist.

Turning now to more peaceful topics, I must first allude to the successful completion of one of the greatest, though not, perhaps, the most difficult, of the many important undertakings of the present age. The Alps have at length been pierced by the Mont Cenis Tunnel, and thus the south of France and the north of Italy have been placed in easy inter-communication by a line of railway which affords to England the most rapid means of transit to and from her Indian dominions. The conception of this noble work was distinguished by a grandeur which at one time seemed to imperil the realization of the scheme, and it is believed that if the Emperor Napoleon had not himself fully appreciated the importance and the practicability of the project when others doubted both, and thus brought the two Governments of France and Italy to the support of the undertaking, it would not have been proceeded with. The history of this laborious enterprise has so recently been before you, that it would be superfluous in me to attempt a particular description. Let it suffice then to refresh your memories by stating that the tunnel was commenced on the 31st of August, 1857, and that it was finished on the 14th of September, 1871, thus occupying 14 years in its construction; that it is about 7½ miles long; that it is about 4400 feet above the level of the sea, and about 5100 feet below the summit of the mountain; that it was cut through strata, consisting for the most part of micaceous sandstone intermixed with micaceous schists, dolomitic, and cryotalline limestone and limestone schists, and veins of quartz alternating with argillaceous schists, somewhat hard in their character, and occasionally decidedly difficult to penetrate, but fortunately yielding little water; that the excavations proceeded from both ends, and that the work was set out and directed with such extraordinary skill and accuracy that the junction was perfect in respect of both direction and level. The work was carried on by means of a very ingenious level mechanical drilling machine, actuated by atmospheric air compressed by the Alpine water power in an ingenious apparatus placed at some distance without the mouth of the tunnel, and thence conveyed to the drilling machines through iron pipes. The tunnel was designed by and was constructed under the direction of the Italian engi-

neers MM. Sommeiller, Grandis, and Grattoni, of whom we may on this, the first occasion which has presented itrelf since the successful inauguration of this great international work, express a well-merited admiration, and to whom, although it be only by way of acclamation, the members of this institution may, I think, properly offer their warmest congratulations.

Another great work of foreign origin, the Suez Canal, has also been very recently so far completed as to enable large ships to pass through it from the Mediterranean to the Red Sea. The propriety of attempting this communication was at one time doubted, both on commercial and physical grounds, because whilst in the first instance it was believed, on the authority of a French survey, that the waters of the Red Sea were about 10 mètres higher than those of the Mediterranean, and that therefore a current sufficient for the purposes of scour might be commanded, it was on a re-survey discovered that the two seas were practically on the same level, and that therefore no self-acting current of scouring power could be obtained. It was therefore feared the proposed channel must either become refilled by the drifting sands of the desert, or that it would need to be so continuously dredged as to involve a ruinous amount of working expense. For some time—namely, till the year 1860—the project languished, but at length, owing to the untiring exertions of Mons. (now Vicomte) Lesseps, and the encouragement afforded by the Governments of France and Egypt, the undertaking was commenced, and after nearly ten years of indomitable perseverance, and the expenditure of many lives and much treasure, was so far completed as to enable the opening ceremony to be performed in the month of November, 1869, in the presence of His Highness the Khedive of Egypt, and of his Imperial guests, the Empress of the French and the Emperor of Austria, and many distinguished persons.

The canal is 99 miles long, is, or is intended to be, 328 feet wide at the surface, and is, or is intended to be, 26 feet deep throughout. The work has been made, and the English and other commercial nations are freely availing themselves of the opportunities it affords as a water highway to the Red Sea, the Indian Ocean, the shores of the Pacific, and the continent of Australia, and are thus practically testfying to its present utility. Let us then hope that whether or not a commercial success is found to follow upon the realization of the great adventure, the means will be always forthcoming to prevent it lapsing into decay and desuetude.

Railway construction abroad has been greatly interfered with, and in some parts of Europe almost arrested, by the recent wars. Whilst on the one hand international struggles have demonstrated the necessity of railways for the conveyance of food and munitions even to contending armies, yet, on the other hand, the waste of funds and the paralyzing exhaustion caused by the reciprocally destructive efforts of the belligerents render for a time any important enterprise in the countries affected by the conflict all but impossible. Even adjacent countries are so far influenced by the interruption of the channels of business, and by the liability of being involved in the quarrel, that projects of public or private utility become neglected or cease to attract attention. Influenced by such events quite as much as by the financial collapse of 1866, we in England have, for some years, disregarded the various suggestions for improving the means of communication between this country and France, for extending the European system of railways to or towards our Eastern possessions, for uniting the Swiss and German railways with those of Italy, and for completing by private enterprise, rather than by governmental action, the vast ramification of iron roads which are required in India for the civilization, the good government, and the general advantage of 150,000,000 subjects of the British Crown.

On the last-mentioned of these matters I have to remark, with considerable anxiety, that our own Government has of late manifested a decided disposition to discourage private enterprise, which, with all its admitted defects, has made England the great nation she is, and to amass to itself all that most dangerous and necessarily ill-used if not misused power and influence which are created by the possession of many places, much patronage, and the distribution of large funds raised not for the few and comparatively uncomplicated purposes incidental to the care and protection of the people, but for the purpose of entering into an unnatural and depressing competition with the persons, sole or aggregate, from whose pockets the pecuniary means employed by the Government are derived. I am aware that in reply to, or in extenuation of this charge, it is attempted to be alleged that if there were no lenders there would be no borrowers, and that, consequently, we who regard this action of the Government with distrust and apprehension have only ourselves to blame, since we have in our hands the easiest of all possible remedies, namely, that of withholding the funds. But is this really so? We are a money-making people, and we must have employment for our savings, even though when thus deprived of the opportunities of investing it in private enterprises we lend it to the Government; nevertheless we like, above all things, to invest our money in our own way, and to take a personal and individual interest in its employment, whether for fructification or the contrary. This is more or less the business of every business man, and it forms an integral and important part of the active life of the nation, and it has long been, and still is, a prominent and, when exercised with self-control and prudence, a most commendable cause of the intelligence, the energy, the progress, and the resourcefulness of the people. Deprive us of our enterprising spirit, reduce us to a grateful and dependent 3 or 4 per cent. receiving people, make the Government once for all paternal, and we shall speedily sink into the contemptible category of grown-up children, wishing and waiting in all possible affairs for the guidance and control of a central authority.

The existing railways of India are now both extensive and important, and at present possess the advantage of a uniform gauge of 5½ feet. This audience will therefore be surprised to learn that this existing uniform gauge is now to be departed from, and that upon the obviously crotchety suggestion of some unknown individual the French mètre gauge of 3 feet 3⅜ inches is in future to be employed.

In India, then, is about to be introduced the very evil, consequent upon the absence of uniformity of gauge, from which the wise and deliberate action of an experienced private enterprise in England is now busied in effecting our emancipation; and also to be initiated, for no useful purpose that I can perceive, one of the worst founded and most perplexing measures of length with which it has been my fortune to become acquainted—a measure which bases it claim to universal acceptance on the intangible ground that its length is, by its own unprovable assertion, exactly one ten millionth part of a quadrant of the earth's equatorial circumference! The introduction of the French metrical standard into India might indeed be possibly justified on the ground of expediency if England had previously adopted it; but till then I shall venture the assertion that to attempt to force upon the Oriental mind a novel system, and the labour of acquiring what will be to it an uncouth jargon, is as injudicious as it will certainly be unsuccessful. Nor can I conceive on what sufficient grounds it is being attempted to introduce the measures of France into use in this kingdom. The English unit of length, the yard, is just as capable of being referred to a natural standard as is the French unit, the mètre; whilst the English unit, either as the yard or the foot, has been adopted and is used by far more millions of people than are now using the French unit. In Russia, in the United States, in Canada, in the East and West Indies, in Australia, and throughout the British Colonies in which the English language is spoken, the established English measure of length is exclusively employed, and these are the countries in which fully four-fifths of the commercial business of the world is carried on. Nor does the "ten finger" system of decimals, frequently employed as an argument in favour of the introduction of the mètre, confer any advantages which are not more than counterbalanced by its disadvantages.

In the British Islands, many engineering works of importance have been unostentatiously brought to a successful completion during the past two years. With respect to some of these you are already well informed, and with respec to others you will, I hope, shortly become so through such communications to this institution as the able designers of those works may be induced to present. I, therefore, now pass without further remark to the branch of engineering, in the practice of which I am myself the most interested, and upon which I can, therefore, address you with such confidence as a long and varied experience may justify.

This branch of engineering embraces, and for the most part restricts itself to, the practical application of those of the physical sciences which relate to the properties, conduct, and treatment of fluids, whether inelastic or gaseous. It therefore comprehends within its scope the provision and distribution of water and gas for the supply of towns; the collection, conveyance, and utilization of sewage; the employment of atmospheric air as a means of impulsion in tubes, and for the ventilation of mines; the improvement of rivers and estuaries; the reclamation and defence of land from the sea; the drainage of fens, and the collection and application of water for use in irrigation; and it even renders its assistance to the determination of the suitable form, and the amount of mechanical power, to be given to a ship to enable it to fulfil the conditions imposed by the requirements of commerce and the necessities of war.

From this very partial enumeration of the professional occupations of the hydraulic engineer, it may be inferred that this department of our practice is replete with scientific and practical topics of no common interest. Accordingly, to the discussion of these and their allied subjects this institution has ever been willing to afford its best and most effective assistance, and, speaking on my own behalf, I can truly state that, from these discussions, I have not only derived many advantages in the solution of practical difficulties, but that I have also experienced the further benefit of having my mind driven from habitual lines of thought into new tracks, which have not unfrequently conducted to improved results.

If the last few years have contributed little to our former fund of purely scientific knowledge, the works they have seen executed have not only been both numerous and important, but are such as have added greatly to the not less necessary stock of practical data which, when generalized by means of comparative diagrams, or other well-known methods of treatment, become the foundation of the valuable empirical rules or formulæ by which every careful engineer is guided in the numerous cases which lie without the confines of scientific investigation. In this way, for instance, we have become acquainted, within narrow and gradually diminishing limits of error, with the extent and effects of the periodical fluctuations of observed rainfalls, and with the influence of elevation and position on the amount of water capable of being utilized for the supply of cities; and with the allowances to be made for the losses of evaporation from differing surfaces of land and water. In like manner we can now estimate with considerable precision the magnitude of the floods for which provision must be made in the construction of weirs and bye-washes. We have gradually attained to rules of construction more satisfactory than the "rule of thumb" and "scowl of brow" methods to which our ablest predecessors were compelled to resort whenever they were brought face to face with a novel constructional problem; and, finally, we have become acquainted with the true measures of the wants and requirements of the very variously employed populations of our widely differing towns and even with the limits within which waste may be controlled without the imposition of any restriction on the use of water, by the adoption of simple and judicious regulations applicable to the construction and arrangement of the consumer's domestic fittings. The data thus derived are too numerous, and would require too large an amount of explanation, to justify me in placing them before you on this occasion. They shall, nevertheless, be communicated in another form. The information lastly referred to has, however, a special interest attaching to it, not only because the system of constant supply is being rapidly introduced into provincial towns, but because Parliament, in the last session, passed a measure for the almost immediate application of it to this metropolis. This Act comes into operation on the 21st of the ensuing month, when the metropolitan authorities will become entitled, in the language of the Act, to be "of opinion that there should be in any district a constant supply." The fittings in use in this metropolis are, however, of a kind, and are in a condition so thoroughly unsuited for the reception of the constant supply, that the greatest care and caution must be exercised in its introduction, on the one hand to prevent an unsustainable amount of waste, and, on the other hand, to avoid the destruction of property which will otherwise result from the bursting of pipes and the overflowing of cisterns. Not only are the consumer's pipes and fittings commonly of a very unsubstantial character, but in too many cases they are built into walls, and are carried behind plastering, and are laid within ceilings to which no means of access are afforded; and, as a rule, the water-closet apparatus, however ornamentally it may be cased, is, to say the least, in a very imperfect and unsatisfactory state, as are also all the overflows and air-pipes, which for the most part communicate with the drains, and so operate to introduce the noxious sewer gases into the apartments in which the apparatus is placed. A provision is indeed usually made (which, however, not unfrequently fails) to prevent this mischievous consequence by trapping the air and overflow pipes with water afforded by the periodical overflowing of the cisterns, but as this existing system of intermittent waste would become continuous and ruinous if the water were constantly supplied, it follows that along with the alterations due to the introduction of the constant supply other structural alterations, in many cases of a still more extensive character, will need to be effected.

The success or failure of this well-intended measure will depend, then, not so much upon the water companies as upon the discretion with which the public authorities may proceed to bring it into operation. If the authorities act with due caution in the selection of small districts, and by preference those in which the dwellings of the industrial classes most abound, and then, after reforming the fittings of the one district, advance to a second, and so proceed from time to time, a successful issue may be anticipated; but, if the authorities allow themselves to be actuated by injudicious and impetuous representations, a sudden revulsion of feeling and a consequent failure of the Act will become inevitable.

Amongst the questions involved in the discussions relating to the measures proper to be adopted for supplying towns with water, is that of the selection of the fitting source; and of late years some theoretical chemists have gone so far as to assert that the presence of nitrates, nitrogen, organic carbon, and common salt in potable waters, are infallible indications of the presence of matters injurious to health and not improbably dangerous to life itself. Nay, even the unwarranted phrases, "previous sewage contamination," and "solid impurity," have been invented to frighten Her Majesty's subjects from the use of some of the purest and most harmless, as they are certainly the most agreeable, descriptions of waters the world can furnish. Again, on the occasion of an epidemic alighting on any of our English cities, an official medical man is now usually sent from a Government department, and in the majority of instances forthwith charges the temporary prevalence of disease upon the character of the water supply. I trust to be able, in a very few words, to dispel these, and, with them, all similar delusive notions. In the first place, I find as a statistical fact, that the towns in which the highest death-rates have occurred are precisely those towns in which the commended waters are supplied. In the second place, I find, as another statistical fact, that in the towns in which the lowest death-rates have prevailed, the discommended waters are habitually drunk. In the third place, I find, as a further statistical fact, that in the cases in which the character of the water supply is unvarying, as, for instance, where the water is derived from deep shafts sunk in the open country,

and in situations quite remote from population, the death-rates of the towns thus supplied exhibit, when plotted on a diagram, precisely the same undulations and transitions from the minimum to the maximum, and again from the maximum to the minimum, that are exhibited in the instances of those towns in which the supply is, and must necessarily be, subject to extreme variations in the very particulars upon which the theorists base these truly alarming doctrines. In the fourth place, I find, as a fact in chemistry, that the noxious compounds, for the presence of which the water supply and the water suppliers are endeavoured to be made responsible, are actually furnished by rain or the atmosphere, and sometimes by both, or that they are actually existing, more or less abundantly, as ordinary mineral constituents of the strata from which the water is withdrawn. Whilst, however, I am thus led by a diligent investigation of comparable results, to the irresistible conclusion that the doctrines in question rest on no solid foundation of ascertained fact or inductive theory, I do not on that account rush to the opposite extreme, and declare my opinion to be that the hydraulic engineer may properly ignore the chemical inquiry, and in general accept any source from which a merely competent supply can be obtained. On the contrary, as it seems to me, it is the first duty of the engineer to investigate the quality of the water obtainable from every available source, and to recommend that one which, under the special conditions of the case, would, on the whole, be the most suitable for the general purposes of the population. Thus, for the supply of a manufacturing town in which water is to be largely used for business purposes, a soft water collected from moors, although it may not be colourless, will prove to be the most advantageous; whilst for the supply of a non-manufacturing town, a coloured water, whatever might be its other useful properties, would not be tolerated. In the manufacturing districts of Yorkshire, the brilliant water with which Brighton is satisfactorily supplied would be contemned on account of its hardness; whilst, in Brighton, the softer waters with which many districts of Yorkshire are also satisfactorily supplied would be repudiated on account of their peaty colour.

On the subject of the removal of the sewage of towns, no new suggestions of importance to the professional engineer have recently appeared, nor, indeed, does it seem that in this department of municipal improvement much remains to be accomplished. It is, however, worthy of remark, that in house construction it seems desirable to abandon the use of earthenware tubes with numerous and imperfect joints, and to substitute the use of iron pipes with few and perfect joints care being taken to provide a sufficient number of flanched or tightly-stoppered branches, to afford the means of access to the interior. By this simple arrangement, the escape of foul water and fœtid gases from the drains into the lower stories of our dwellings may be effectually prevented, and it will become a comparatively easy matter to apply in connexion with such pipes an effective apparatus without the house for preventing the access of contaminated air from the main sewers. In many cases, the so-called "ventilation" of the sewers is much neglected, and invariably with the natural result that the pent-up sewage gases make their escape at the place of greatest pressure or least resistance, and commonly into some house towards which the sewer ascends.

The question of the best means for effecting the purification of sewage water, and for the utilization of sewage matter, is still unsettled, and the controversy has assumed the dimensions and character of a party conflict in which the fact that the truth is not wholly with either party, and yet is partly with each, has been almost if not entirely lost sight of. That the application of liquid sewage in aid of the cultivation of land may be the means of raising prodigious crops of certain descriptions of vegetation no one will deny; but it is far from being established that the results can be realized with profit, or indeed without occasioning a serious loss, when the operation is to be performed, not at the cultivators will, but under the constant pressure of legal and sanitary obligations. Nor has it been shown how or where the larger towns can acquire, at a reasonable distance, of a suitable quality, and at the requisite elevation, the enormous areas of land the employment of this system requires, or how or where a daily market is to be found for the excessive quantities of the peculiar and perishable productions of an extensive irrigation farm. I admit the principle is sometimes applicable to the needs of small communities, but I have not as yet seen any evidence of its general availability in the cases of large communities; although, of course, special instances, exceptional to any general rule, may perhaps exist.

On the other hand, the process of purification by chemical means seems to me peculiarly suitable for adoption in those frequent cases in which the utilization of the sewage by the process of irrigation is infeasible. That the sewage can be readily cleansed by chemical means to a sufficient extent to render the effluent water reasonably admissible into a running stream I have often witnessed. That the process has hitherto been conducted with all the care and attention it requires I do not believe, and that it is, or can be made, a source of profit to the manufacturer of artificial manures remains to be demonstrated. As an engineer wedded to no system, and belonging to no party, I desire that this process should be allowed that measure of fair play which has not hitherto been accorded to it, if only for the not unimportant reason that it involves a capital of about an eighth or a tenth part of that which must be embarked in works of utilization by irrigation, and I also wish that it should not be hastily ignored and discountenanced by or in consequence of central interferences with the discretion of local authorities.

In the manufacture and distribution of gas for the purposes of illumination no improvements of much importance have been recently effected, nor does it appear to me probable, that so long as we command an abundant supply of coal, the use of gas produced from that article will be superseded, or that the methods of distillation by heat and distribution through pipes, now in use, are likely to undergo much alteration. It is, however, of interest to engineers to know that, year by year, gas undertakings are increasing both in number and magnitude, and that the consumption of gas in nearly all our large manufacturing towns has become duplicated in about every eight years, from 1840 to the present time, and that between 30 and 40 millions of private capital are now invested in the gas-works of these kingdoms.

Atmospheric air as a motive agent will, I think, make its way into more frequent employment. For several past years its value, as a means of propulsion, has been little, if at all, recognized; probably in consequence of the universal failure of the atmospheric railways established in England, Ireland, and France; and hence the study of the circumstances under which this fluid may be rendered serviceable has been almost entirely abandoned by the members of our profession. Latterly, however, the success which has marked the application of this system by Mr. Siemens, to facilitate the delivery of postal telegrams, both in Berlin and London, has again attracted the thoughts of engineers to this subject. The peculiar properties of elastic media, and the ease and safety with which atmospheric air, as one of such media, may be employed for the transmission of the lighter descriptions of goods, and even exceptionally for the conveyance of passengers, especially at moderate speeds, and for short distances, and in situations where other ordinary means would be inconvenient or out of place, commend the system to our unprejudiced consideration. But it may, nevertheless, be noted, that the very nature of fluid friction, which increases directly as the square of the velocity and as the length of the column to be set in motion, precludes the possibility of this system being advantageously compared on merely economical grounds with other mechanical methods of effecting equivalent objects. On the score of convenience alone this system must rest its claims to support, but the sacrifices of power we are in the constant habit of making, in order to attain our ends by any methods more convenient than others, justify me in assuming that merely economical objections will not prevent the adoption of this system for those purposes of convenience for which it is more peculiarly suited.

For the improvement of rivers and estuaries, no newly designed works have, I think, been carried into execution in this country during the past two years. Steady progress has, however, been made with those which had been previously undertaken. I point in particular, and with peculiar satisfaction, to the truly magnificent walls and terraces recently erected by the Metropolitan Board of Works for the embankment of the river Thames; and I trust the time is not far distant when both sides of the river will undergo the like treatment from at least Southwark Bridge to Battersea. This end accomplished, the metropolis of England will present from its bridges a perspective of unrivalled beauty.

In works of reclamation, nothing of importance has been undertaken, possibly because of the now almost settled conviction that to wage a great war with the mighty deep is, in truth, only a mode of performing the very unprofitable operation of casting useful money into the sea. In this conviction I entirely concur, but I nevertheless know that valuable accretions may frequently be made to sea frontages, at little cost, providing the operation be limited to a depth of three or four feet, and that it can be naturally assisted by the deposition of an argillaceous or other adhesive and compacting warp.

With regard to the collection and application of water (other than sewage water) for the farmers use in irrigation, little has been, or, indeed, can be effected in this country; because, firstly, running streams are common property, and as such are very properly protected by law for the common use; because, secondly, the English climate is neither sufficiently hot nor sufficiently arid to render irrigation necessary, or, indeed, useful for the purposes to which it is freely applied in warmer and less humid countries; and because, thirdly, the very undulating character of the surface of England renders the laying out of the ground too costly for the purses of either landlords or tenants. Add to this that irrigation must in England be almost universally assisted by a carefully devised and expensive system of under drainage, and we see at a glance the why and the wherefore it is that the British farmer appears to the agricultural theorists so "unaccountably indifferent" to the advantages alleged to be offered by operations of this description.

With regard to the last and not the least important of the topics on my list—viz., the determination of the forms and appliances of ships—I am happy to acquaint you that the Government has, on the nation's behalf, authorized a committee, consisting of Lord Dufferin, Admiral Stewart, Admiral Hornby, Admiral Elliott, Admiral Ryder, Captain Goodenough, Captain Hood, Mr. G. P. Bidder, Professor W. J. Macquorn Rankine, Mr. William Froude, Mr. G. Rendel, Professor Sir William Thompson, and Dr. Woolley, to make an exhaustive scientific and experimental investigation of the laws of the stability and frictional resistance of floating bodies. From the results of this investigation, and the recognized ability of the gentlemen by whom it is being conducted, I anticipate discoveries of a very interesting and a more than usually practical character—discoveries useful alike to the engineer, the shipbuilder, the Admiralty, and the merchant. When the report of the committee becomes available to the profession, it will, I trust, be freely and vigorously discussed within the compass of these walls, to the end not only that we, as engineers, may the better comprehend its import, but that we, may also have the opportunity of exchanging our individual views and ideas and experiences upon, and respecting the several matters to which that document will relate.

On the subject of professional education I wish to say a few words, and I would address them rather to each one of the 200 students of this Institution who may happen to be now present than to the members who have acquired, and who have usefully employed, that peculiar knowledge by which they are severally known and distinguished.

To the students, then, I would say—1st. Of all things, don't attempt too much. 2nd. Keep up and augment your knowledge of mathematics and the applied sciences, especially of those sciences which are most needed in that walk of the profession which you have selected for your own path; but again, I say, do not attempt too high a flight, for if you do you will never become a practical man. 3rd. Do not let your French grow rusty, and acquire German, if your leisure and aptitude are sufficient for the purpose, because your future avocations may be in countries in which these languages are either habitually spoken or are in considerable use. 4th. Acquire in the office, and by the study of esteemed works, a knowledge of form and design; 5th, but bearing in mind that you will never become a practical engineer on theory alone. Take every opportunity which presents itself of becoming apt in surveying and levelling, and in the methods employed in the setting out of works. Learn the uses and applications of tools. Make yourself able to distinguish a good material from a bad material, good workmanship from bad workmanship, sound ground from treacherous ground, good puddle from bad puddle, good mortar from bad mortar, and a good workman from a bad workman. This knowledge is not to be obtained in a school, a college, or an office, and cannot be learnt from books. 6th. Make yourselves acquainted with every description of plant, and all the appliances and contrivances which an experienced contractor employs for the purpose of rendering a paper design into a substantial construction. 7th. Keep brief treatises on geology and chemistry always at hand, for some acquaintance with these sciences cognate to engineering is, in the present day, almost essential. 8th. Practise as much as possible the art of mental computation, for this will give you the means of almost intuitively arriving at determinations on questions of cost, and of at once seizing on the best of several alternative plans or methods. 9th. Be not afraid of soiling your hands or dirtying your boots, but be in every other respect—in thought, feeling, and conduct—a gentleman.

I shall, on my part, be happy to afford to the students of the Institution all the opportunities in my power; and therefore, if they will do me the pleasure to accept an invitation to visit with me the Leicester Water-Works, one of the most recent constructions of the kind, and almost the only one which combines in itself the storing, the gravitation, and the pumping systems, I shall be only too glad to make all the necessary arrangements for this purpose.

In conclusion, I must again acknowledge the honour you have conferred upon me; and this the more especially that I cannot do other than feel that to become elected to the chair of this Institution is to have attained the highest position to which a British engineer can aspire. I will endeavour to perform the functions of the office as effectually, and, I trust, as worthily, as in me lies. That I may count on your cordial support for the maintenance of order in your debates, and in the discharge of my other official duties, I feel fully assured.

HUDDERSFIELD TOWN COUNCIL.

PURCHASE OF THE GAS-WORKS.

A Special Meeting of the Huddersfield Town Council, was held in the Council Chamber, Ramsden Street, on Thursday, the 4th inst.—the MAYOR (Wright Mellor, Esq.) in the chair.

The TOWN-CLERK (Mr. Batley) having read the results of the General Purposes Committee, appointed on the 18th of August last to enter into negotiations for the purchase of the Huddersfield Gas-Works, and also read the minutes of the various meetings of the General Purposes Committee,

The MAYOR reviewed, at considerable length, the action of the committee in the consideration of this matter. He then said that when an Act of Parliament was obtained they had to fairly face and grapple with the entire question. It was their duty in every respect to do so, both to themselves and to the ratepayers, so that the matter might be settled. They had to take into consideration a question as to a much larger supply of gas to the entire borough, and this was a very important matter. In the first place they had a gas company holding their position by Act of Parliament. They had likewise some gas-works at Kirkheaton, and also at Moldgreen. And, he believed, one or two parties were

making gas in Almondbury, Berry Brow, and Lockwood; and on the western boundary of the borough there were the Longwood Gas-Works. Now, if they conceded to one party for the supplying of gas to a district, he did not see on what grounds they could refuse other parties, when they had the same power. What followed? Simply that by their own consent and concurrence they would be raising up a number of vested interests over the whole surface of the borough. And then, afterwards, when it might be thought advisable to take the whole supply of gas into their own hands, they would find themselves in such a position as they would be forced to give an enormous price in order to buy up the whole of those various proprietors. Such being the case, it was important for them to face the difficulty, and he was very glad to see that the General Purposes Committee had at length faced it in the only way they could fairly meet it. At that juncture of affairs he might say that, had they been the first corporation in the kingdom taking the matter in hand, or if they had been about to try an experiment which no other corporation had tried before, they might have paused and considered as to what they should do. But when it was a course of action which had been acted upon by very many corporations in England, it was but natural for them to see what their neighbours had done. Well, at Halifax, Bradford, Leeds, and many other places the corporation had taken the gas-works, and had found it to their advantage to do so. Having to face the difficulty themselves, and having seen what other corporations had done in the matter, the General Purposes Committee decided that it was their duty if possible to get the gas-works into their own hands. For that purpose they authorized the committee to seek an interview with the gas company for the purpose of ascertaining their views on the subject. They waited upon the gas company and got their permission for an interview at once; and he was bound to say that all through the gas company had acted with an openness and straightforwardness which was beyond all praise. They told them at once that they did not want to part with their shares in the works, that they were quite satisfied with their own company, and preferred having their own property in their own hands to selling it to the Huddersfield Corporation. But as the corporation had got an Act of Parliament, and as they saw that the spirit of the times was in favour of gas companies being purchased by corporations, and in order to show that they were not wishful to set themselves against the Corporation of Huddersfield, they were perfectly willing to part with their shares if the corporation would give them a proper price for the sale and transfer of their property. He was sure what he had said would be confirmed in every respect by the ex-mayor, who made the negotiations between the General Purposes Committee and the gas company, and who directed them with the ability which had always distinguished him in public matters. The Gas Committee had had three or four meetings, but he would not go into matters of detail, as the town-clerk would give them the whole of the details, traced by the committee step by step. On behalf of the General Purposes Committee, he must tender his thanks to the council for the reticence which they had preserved during the time the negotiations were proceeding, and for the confidence they had reposed in them, and which he and the other gentlemen composing the committee greatly appreciated. He could not offer any further explanation of the matter, but the town-clerk would read the report.

Alderman CLOUGH asked how it was that he had had no notice to attend the meeting, after having been appointed on the General Purposes Committee.

The TOWN-CLERK said that he had been appointed member of the General Purposes Committee to take into consideration the railway amalgamation schemes.

Alderman CROSLAND said that he had proposed Mr. Clough as a member of the General Purposes Committee, and no such thing was mentioned.

Alderman WOODHEAD said that he understood Alderman Clough had been appointed on the committee to consider the railway amalgamation scheme.

Alderman CLOUGH said he did not understand it in that way, and sooner than agree to such an appointment he would have his name struck off the committee.

The MAYOR was exceedingly sorry that a misunderstanding such as that had occurred, because they would have been glad to have the benefit of Alderman Clough's advise on the matter.

Alderman JONES (the ex-mayor) said that the General Purposes Committee had always felt embarrassed by the reading of the resolution appointing Alderman Clough on the committee. The fact of his not having been advised of the meeting was not on account of any discourtesy towards him, but from a feeling that they could not, on the reading of that resolution, go any further than they had done. The general practice on former occasions had been to elect a member on the General Purposes Committee for a specific purpose. When he was appointed the railway amalgamation scheme was mentioned, and therein lay their difficulty.

After some further discussion, the subject was allowed to drop.

The TOWN-CLERK then read the following report:—

The General Purposes Committee appointed to enter into communication with the Huddersfield Gas Company, with reference to the transfer of their works to the corporation, beg to report as follows:—

Before detailing the result of the communications which have taken place, the committee would call attention to a few facts and considerations, some general and some local, which bear materially upon the question of the desirability of the gas supply of the borough being placed in the hands of the corporation.

Your committee have obtained information of the state of things existing in a number of other boroughs, and they find that in one or two instances the gas-works have been originally established by the public authorities, as at Manchester, where they have yielded such large profits as to enable the corporation to execute a great number of public improvements without any contribution from the rates. In a great number of places, however, the works have been in the first instance established by private companies, and subsequently acquired by the corporations, and in these cases also the general result appears to be that considerable profits have arisen, applicable to the improvement and benefit of the towns, in relief of the ratepayers, whilst the interests of gas consumers have been amply protected, and in no way prejudiced by such arrangements.

With these encouraging instances before them, the committee have addressed themselves to the case of Huddersfield, and they find that, whilst the general considerations applicable to other boroughs apply with equal force here, there are special considerations of a local character which greatly increase the desirability of the proposed change. No fault can be imputed to the Huddersfield Gas Company as regards the management of their works, which appear to have been conducted efficiently and economically, and so as to reflect credit on the directors and manager. Their powers, however, do not extend over the whole borough. Several large and important districts are outside their operations, and, to a great extent, excluded from them by a veto power conferred by the Act of 1861. In these excluded parts of the borough there have been established a number of smaller concerns, in the hands of various owners, but their undertakings cover only small portions of these districts, and even these they supply without statutory powers, and without the restrictions and conditions for the protection of the public which always accompany such powers when granted by Parliament. Some of these parties, indeed, propose to extend their manufacture and supply of gas in various directions, but it is manifest that the more this divisional system of gas supply of the borough is extended, the more inconveniences and complications will arise, and the greater hindrances in the way of placing the whole borough on a uniform and satisfactory footing with respect to gas.

These considerations point strongly to the propriety of the proposed acquisition by the corporation of the works of the Huddersfield Gas Company, as a first step towards that end, and with this view the power of making the purchase was inserted in the Improvement Bill of last year, and has been obtained from Parliament.

On approaching the directors of the gas company upon the subject the committee found that they were not indisposed to sell on fair terms, and the committee consequently proceeded to make some investigation of the accounts and affairs of the company, with a view to arranging terms of purchase. For this purpose they procured, from the clerk of the peace's office, copies of the published accounts of the company, from the date of their Act of 1861, and were furnished by the directors with such further accounts from their books as were requisite.

The company's authorized share capital is £69,000, bearing an authorized maximum dividend of £5850 per annum, but their net profits in the year 1870 would appear to have amounted to nearly £3000 more than this maximum dividend. In addition to their share capital they have received £3656 5s. for premiums on the public sales of shares issued, which, according to the Act, has been applied as capital, but bears no interest. They have also, by means of the profits which they have realised beyond the dividends, accumulated reserve-funds amounting together to £16,856 0s. 6d., and they have taken up on loan £3100. These sums together make up a total capital of £102,164 5s. 6d., of which the sum of £86,462 2s. 7d. stands in the shape of works, and the remainder in good book debts, stock-in-trade, cash and investments.

The committee deemed it right to assume, without any costly inquiry by engineers or valuers, that the expenditure on the works made by the company has been well and judiciously made, and that their value may be safely taken at the figures stated in the accounts rendered for all purposes of the present negotiation. Much money may be expended on an inquiry into structural value, and inasmuch as the skilled valuers on one side would have to be met by similar ones on the other side, the cost of both being ultimately borne by the purchasers, the committee have preferred to rest on what is the truer criterion of value—namely, the market value of the shares. For it is obvious that, as to the £48,000 expended in works which bears an authorised dividend of 10 per cent., the expenditure is not the criterion of value. It alone must be worth, at least, twice its nominal amount, or more than £100,000.

It is somewhat difficult to ascertain the true market value of the shares, they have been so scarce in the market. The public sales of new shares, issued under the Act in the years 1866, 1867, and 1868, show an average of price somewhat under £40 per share, the two former sales being under and the latter slightly over that figure. These sales, however, took place in times of considerable depression of trade. The published share lists of Mr. Moore have quoted the prices at from £40 to, in the latest lists, £43 to £44. Something depends, of course, upon the period of year at which a sale takes places, and whether the price carries more or less dividend. But taking all things into consideration, your committee came to the conclusion that they might with propriety open the negotiation with the gas company at £43 per share, or a total purchase-money of £125,775. The committee, therefore, commenced by an offer of these terms to the gas directors. They were, however, at once declined, and it was stated that under the advice of Mr. Hawksley and Mr. Barlow, two of the most eminent gas engineers in England, the directors had fixed on £50 per share, or £146,250.

The directors also stated that they had taken the opinion of a very eminent counsel as to their power of capitalizing and converting into shares bearing 10 per cent. interest, to be allotted direct to the shareholders without public competition, their borrowed money, the limit of which is fixed by the Act at £15,000, and they had been advised they were entitled to do so. Of course, if such a scheme were carried out it would at once add £15,000 to the market value of the concern, inasmuch as the 10 per cent. dividend payable would command double the nominal amount of these shares. The committee entertain great doubt about the feasibility of this project, but the fact of its being mooted, and of its having been the subject of resort to counsel's opinion, pointed seriously to the importance of effecting the purchase at once, before any such scheme could be attempted.

Ultimately, after considerable discussion, at one of the meetings, one of the most influential of the gas directors (Mr. Jere Kaye) stated that individually he would be prepared to accept £48 per share, and although this was at first said to be unauthorized, and contrary to the common decision of the directors as a body, yet it was ultimately acquiesced in by the others, and was made a distinct offer, the purchase-money at this rate amounting to £140,400. The difference between this price and your committee's first offer was £5 per share, and your committee, after further consideration, increased their offer to £45 10s., thus in effect dividing the difference. This, however, was also declined by the gas directors, and a distinct intimation given that the £48 per share, being 24 years purchase on their authorized dividend of £5850 per annum, must be considered as their ultimatum.

At this stage of the proceedings, and as the gas company had so freely quoted the opinions of Mr. Hawksley and Mr. Barlow in support of their price as reasonable, and as your committee had no professional opinion whatever on their side, either to check or confirm them, they felt that in so important a matter they could not take on themselves the responsibility of proceeding further without first consulting some high authority upon the subject. They, therefore, referred it to their parliamentary agent, Mr. Shrubsole, to select from the leading gas engineers of the class of Mr. Hawksley and Mr. Barlow, the fittest gentleman for their purpose, and he selected Mr. Robert Jones, C.E., who is the engineer of one of the largest gas companies in London, and an authority of high standing in such matters.

A deputation of your committee, consisting of the present mayor, the ex-mayor, and the town-clerk, had a conference with Mr. Jones in London, and laid before him the whole facts of the case, and the accounts obtained from the gas company. They found, on inquiry, that the 24 years purchase was a rate which had been sanctioned by Parliament, and after full consideration of the matter, Mr. R. Jones's opinion on the subject was given as follows:—"I beg to report, that having examined the whole of the documents submitted, and assuming them to be *bonâ fide*, I am of opinion that the property as detailed in the accounts, is worth the sum of one hundred and forty thousand pounds (£140,000), and that such sum would be obtainable in any impartial court of arbitration. The results obtained by the present management, as set forth in the accounts, prove it to be careful and economical, though by no means overstrained, and I am, therefore, quite of opinion that in the hands of the corporation the same profit and efficiency may be maintained."

Acting upon this opinion, therefore, and being unable to obtain better terms, the committee concluded a provisional agreement with the gas directors for the 24 years purchase, or £140,400 net, which they now recommend to the council for confirmation.

It must be borne in mind that the 24 years purchase is not applied to the actual earnings of the gas company, but to its present authorized maximum dividend of £5850. The actual earnings are nearly £2000 per annum more than this, and if these be continued, and the purchase-money can be borrowed at 4½ per cent., this margin would remain as a profit to the corporation, towards public purposes and in the relief of the ratepayers, even supposing that no increase or extension takes place in the operations of the gas-works. But in point of fact it is beyond doubt that a great increase and extension will take place from which much larger profits beyond the interest on the purchase-money may be expected. In towns like Huddersfield experience has shown that the vend of gas doubles itself in about ten years, and if to this ratio of increase is added the exceptional increase which may be anticipated from the extension of the gas supply to those portions of the borough which are now without it, it cannot be doubted that a very considerable margin of profit for the corporation will result to the corporation in the course of a few years.

A question has been raised in your committee during the discussions upon this transaction as to whether the corporation will on will not, on taking the gas-works, be bound by all the restrictions on profits which are imposed on the gas company by their Acts of Parliament, in which case, it has been argued, the possession of the works would confer no advantage on the corporation, as they, like the company, might be compelled to reduce the price of gas so as to make no profit beyond what would cover the authorized dividend prescribed by the Act. Of course this question has an important bearing on the value or advantage of the bargain to the corporation, but, even if it became clear that the restrictions did continue, the bargain is one by which the corporation could lose nothing, whilst they had everything to gain, for the restricted profits would cover the interest on the whole purchase-money if borrowed at the current rates, and if yielding no further profit it would confer on the corporation the advantage of the sole control of breaking up of streets, and be the main step towards effecting the extension of a uniform and central gas supply to the whole borough. The town clerk, however, and the London agent of the corporation (Mr. Shrubsole) concurred in advising the committee that in the changed condition of affairs effected by the transfer the corporation would not be bound by the gas company's restrictions, which would altogether cease. This view, of course, gives the transaction a much more advantageous aspect for the corporation, and encouraged your committee in concluding it upon the terms stated.

Your committee are glad to report further that, for their more satisfactory assurance on this point, they have caused the opinion of counsel (Mr. Macnamara) to be taken, and that he confirms fully the opinion given by the town clerk and Mr. Shrubsole as stated.

Another view of the reasonableness of the arrangements now made may be derived from a comparison of the figures when the gas affairs of the borough were before the public in the year 1859. On that occasion the gas-works were offered to the town authorities for £63,000, and after a very careful examination of the concern that offer was accepted by the town commissioners and recommended to the public, by whom, however, it was negatived. Your committee are satisfied that the public were greatly misled in refusing that offer, as the gas company afterwards applied to Parliament, and succeeded in capitalizing a large amount of profits. But at the time of this offer, which was based on the condition of the company's affairs in 1858, the business of the company, its vend of gas for 1858, was 63,000,000 cubic feet, and the price of £63,000 was therefore in the proportion of £1000 for each million feet of supply. If the same proportion be applied to the accounts for the year 1870, they show a vend of about 150,000,000 feet, which, at the same ratio of price, would give a purchase-money of £150,000, and shows, therefore, that the agreed purchase-money of £140,400, is a less proportion on the returns of the concern than the much regretted offer of £63,000, in 1859.

On these grounds the committee venture, unhesitatingly, to recommend to the council to confirm and carry out the arrangements now provisionally made, the powers for which are included in the Improvement Act of 1871, and which, therefore, require no expensive application to Parliament for their sanction.

The MAYOR said he rose for the purpose of moving "That the provisional agreement entered into by the General Purposes Committee of this council, with the directors of the Huddersfield Gas Company, for the purchase by the corporation, of the works, undertaking, property and effects of such gas company for the sum of 140,400, pursuant to the provisions contained in the 204th section of the Huddersfield Improvement Act, 1871, be, and the same is hereby adopted, ratified, and confirmed." After the statement which had been read, he was quite sure that they would see that every care had been taken in the conduct of the negotiation with the gas company, which they must conclude had been conducted with prudence in every respect. He had not the slightest hesitation in recommending the resolution for adoption. He had the greatest confidence, as far as his judgment was concerned, that the transaction would be one that would be ratified by those who succeeded the members of that council hereafter.

Alderman C. H. JONES (the ex-mayor) seconded the motion. He thought it was due to him after having been so closely connected with that business from the first that he should give expression to a few observations. At the outset, long before the negotiations were attempted, he had thought it was the duty of the council not to stand still in this matter, but if possible to acquire the gas-works. The council would be aware that not very long before they succeeded in getting an Act of Parliament the matter was fairly discussed, and therefore it ought to be no matter of surprise to learn that such was his opinion, and they, too, must have been agreeably surprised to find, after they had been told that they could not get such powers, to get them in such clear and straightforward terms, such, in fact, as he felt sure must be satisfactory to every one in that council. After referring to the course they had followed in that action, he said that as a body they had no feeling, and had acted with no feeling but that of justice to the council. They had heard the manner in which the negotiations had been opened, prosecuted, and extended until the present moment; and he was bound to say that they had been met by the gas company in a most cordial manner. With respect to the terms, they had heard them in that document, and therefore he would not touch upon it on that occasion. Without being guilty of a breach of confidence he might state that, although matters had taken the turn they had, Mr. Hawksley entirely concurred in the course he had taken. They had had a little conversation together from time to time about the false position he had taken, but he appeared to think the council had done right in every step they had taken. In regard to the question of price, he had a document in his possession which he had read to the General Purpose Committee. It showed that out of sixteen towns, Huddersfield in the price it paid for gas was as low as any except one. Therefore he thought consumers had not cause for very much complaint at the present prices. Moreover, a doubt had been raised as to whether the present price of gas might be raised so as to be unsatisfactory to consumers. They had two sources of protection against that. The first was that the council comprised gentlemen who held considerable property in the town, who were large gas consumers as well as ratepayers, and whose interest it was keep the price down as much as possible; and they had a check on the 1st of November in each year, when, if their representatives did not satisfy them, they could remedy the matter. He hoped that the course of action pursued by the council with respect to maintaining the price of gas would be satisfactory to every party. They had also every protection in the large millowners who bought gas from the town and wanted it as cheap as possible; and there were a great many gentlemen of position affected by the matter who were more or less interested. The ratepayers had an interest as well as the gas consumers, and if they did not derive the profit in the same respect as consumers, they would certainly derive benefit in some other form, probably in the reduction of some other expenditure. Any benefit that occurred from the corporation taking the gas-works extended to the whole town, and every inhabitant would receive benefit from it. Some might say that it would not be so profitably extended. His experience, however, was that the more it was extended on the right principle, the more profitable it would become. A large portion of the town was in want of gas. A pressure had from time to time been put upon the council by persons who had been anxious to have it extended to them, and who were desirous that it should be supplied forthwith. He hoped, therefore, that they would feel the matter was a necessity, and that they would get to work as early as possible to buy it, and make it advantageous to the outside districts, some of which, at the present, were in a very unhappy position. He believed that the gas directors had given the committee an honest account of their society, and that when they began to break into the matter they would find some source by which they would be enabled to pay it off in little more than 24 years' purchase. He had the greatest confidence in making the purchase, and they knew very well he was no large gas consumer, or warehouseman, or landowner, nor yet a gas proprietor, and that he could have no interest himself in the matter. All he wanted was to do his duty to the public whilst occupying his present position. His anxiety was to do what was right and honest, and while he had the greatest confidence in recommending the council to adopt that course, he was as disinterested as any man could be. He hoped if any opposition was given they would have good grounds given them for it.

Councillor ASTON said that it was with very great diffidence that he rose to speak about this matter, because he felt that there was a great weight of responsibility resting upon those who took action in this question. He, in the first place, disclaimed any party feeling in his opposition to this scheme. He felt that it was one of the most important questions which had ever occupied the attention of this council, involving, as it did, an outlay of at least £200,000. He thought it was decidedly wrong that they should be called upon to give a vote in this matter, when they had only heard the particulars for the first time that afternoon; and thought it was but fair that they should have an opportunity of weighing carefully the facts and figures which had and would be brought before them. His own opinion was that the council would, in a few weeks, be far more able to form a more correct opinion on this question than they could possibly do now, and therefore he intended to propose an amendment, to the effect that the consideration of this question be adjourned until the first Thursday in February, at the same hour and place, in order to give each and every one of them who had not had an opportunity of going into these figures a chance of doing so. In the first place, it was to his interest that the gas-works should be purchased, so that therefore they must admit that he was speaking disinterestedly. He was a considerably larger ratepayer than he was a gas consumer, so that no particular benefit accruing for the gas would go into his pocket as a ratepayer. He, however, thought he would be enabled to show, and to convince them, that they were proposing to pay too dear a price for the gas-works. Now he thought the Town-Clerk had made a mistake, and that the council were going to give the gas company £43 per share.

The TOWN-CLERK: No, £42.

Councillor ASTON: £42 per share was stated to be the full market price, but I have ascertained since that £40 shares have sold for £42, and that £20 shares have sold for £21. That, I understood, was to be offered by us.

The TOWN-CLERK: No, that is not the case.

Councillor ASTON said that point was not material. The negotiations had been going on from time to time, and he thought they were now, and perhaps some of them felt convinced they (the council) were offering too much money for the gas-works, or, in other words, he was sorry to say that the General Purposes Committee were recommending them to pay that sum. He believed that the committee really thought it would be a good thing to give £140,400 for the works, but then he was as fully persuaded that it would not. The General Purposes Committee proposed to buy 3450 shares, 2400 of them at £48 per share represented a capital of £115,200, and 1050 at £24 per share, represented a further sum of £25,200, giving a total of £140,400. Now, he considered that the shares ought to pay 5 per cent. According to the Huddersfield Gas Act of 1861, the amount of money to be declared as a dividend would be £5850, and practical and business men told them that the shares were worth £122,850. That, then, was the market value, and if they gave away more than, they would be giving more than they had a right to give without first appealing to the public. They had been told that they could take it at 4½ per cent.; it would produce £5791 10s., leaving a profit to the corporation of £58 10s.; but then they were also told that they could not borrow that money at less than 4½ per cent. Now if they gave £140,400 and borrowed money at the rate of 4½ per cent. they would have £5937 to pay for interest, and if they only got from the gas-works £5850, a clear loss of £117 would be entailed per annum. If they should want 4½ per cent., they, the council, would entail a loss of £468 on the town per annum. If the council gave £140,400 when the market value of those works at 5 per cent was only £117,000, it would be giving £23,400 more than they were really worth. That was certainly a large amount of money to take away at once, and therefore he thought they ought to postpone the question for a month in order to let gentlemen have an opportunity to see if what he stated was true or not. In 1821 the capital of the gas company was £16,000; in 1861 it was, according to their own statement, £23,000, which, with the £16,000, showed a total of £39,000, and which with £9000 since paid made up a total of £48,000. Now whatever else the gas company had got besides that it had been got out of the public of Huddersfield. If the council, then, gave £140,400 for what had cost the gas company £48,000, they would, he firmly believed, be doing a great wrong to the rateyayers. When he opposed, before the Improvement Commissioners, the purchase of those works, it was shown that the same works were worth £63,000. The commissioners offered £60,000, but, as the gas company wanted £63,000, the bargain was not made. But he thought that the whole sum, over and above £48,000, up to £117,000, which Parliament in its wisdom said the works were worth, belonged to the gas consumers of Huddersfield, and notwithstanding that the General Purposes Committee were recommending them to give £140,400 for the works. He had no hesitation in saying that the gas would be lowered 6d. per 1000 feet if the money which really belonged to the consumers was properly divided amongst them to which they were entitled by Act of Parliament. And, further, he believed if they purchased the gas-works they would have to go to Parliament to extinguish the present company; and if they had to do so it would entail £1000 more expense than the £140,400 they were called upon to pay. Then, again, there was a mortgage of £8000 which the gas-works had borrowed, and which, if the motion was carried, the corporation would be called on to pay, in addition to the £140,400. There was no immediate pressure, and he therefore asked them to defer the consideration of this matter over a month. It was now January; in another month the days would be getting longer, and instead of burning more gas, they would begin to burn less.

Alderman CLOUGH seconded the amendment. He thought it was very strange that the council should be called upon to take an important step of this sort without having, as it were, five minutes' notice. It was impossible to conceive what objection might be raised up against it. He was not prepared to oppose the matter, because he had not had sufficient time to consider it, and therefore asked that it should be allowed to stand over, in order that he might be enabled to do so.

The MAYOR said he preferred the discussion going on.

Alderman CLOUGH then continued. He complained bitterly of the unseemly haste evinced in pressing the bill on, and that the deed already engrossed by the town clerk was then in the room waiting to be signed. He thought such a course was not only wrong to a portion in the council but to the ratepayers.

After some further opposition and discussion,

Councillor HOUGHTON said they had a deep interest outside as well as that they had in the town, and, therefore, wished to have the question settled in such a form that it might be to their advantage. Referring to what Councillor Aston had said, he could see no argument in what that gentleman had stated. The question was not what money had been invested upon the works, but what it was actually worth that day. It was not what the gas company could make of it, but what it would be worth to the council. He thought there was no doubt but that it was one of the very best bargains that they could very well make. What inducement could there be to the shareholders to change their position if they could not make anything by the transaction? None. If they considered the £48,000 which had been referred to, they would find that that arrangement cut two ways. Because they were a corporation, it was not to be said they would only offer the gas company just what they were entitled to receive according to the Act of Parliament. After some further remarks, he concluded by supporting the resolution.

The EX-MAYOR (Mr. Jones) demurred to the statement which had been made by Councillor Aston, to the effect that they would have to pay £200,000. Perhaps that gentleman would enlighten them on the matter. If they were to go to Parliament, as some gentlemen seemed inclined to advise, they would have to pay dearly for it. With regard to the statement that they had offered £42 per share, he was prepared to say he had heard no such statement in committee. They had offered £40 per share in the first instance. They must not expect in such a case to give more than the market price; and, because more than £42 had been given, as he knew, for months past, the council offered, as they only reasonably could, £43 per share. The last time the matter was discussed, the General Purposes Committee suggested that they should not be in such a hurry, but should adjourn the question until both parties should agree to meet together; and in all fairness both parties had now met to settle the question. He had a strong conviction, notwithstanding all that had been said to the contrary, that they would make a grand mistake if they did not close with this bargain.

Councillor ASTON, in reply to some remarks made by the mayor, disclaimed any intention of imputing anything wrong to any one, but he really thought if they went on in this matter they would be taking a leap in the dark.

Councillor CROSLAND supported the amendment, not in opposition to the purchase of the gas-works, but because the negotiations had been going on by the General Purposes Committee, and because that was the first time the committee had been informed as to the terms of the contemplated purchase. He was not in possession of the facts and merits of the case, and therefore could not form a judgment on the matter; and he questioned whether any other member of the council would be able to do so except those who had attended the meetings of the General Purposes Committee.

Councillor MARRIOTT supported the original resolution, objecting to the amendment on the ground that the public would not benefit if the council were to wait another month.

Councillor HOPKINSON, in opposing the motion, said he believed no other committee in the council would have been allowed to carry out such an important matter without first consulting the wishes of the council.

The amendment was then put to the meeting, and negatived by 33 against 15.

Alderman CROWTHER proposed, and Councillor JORDAN seconded the following resolution, which was carried:—"That the mayor be authorized to affix the corporate common seal of the borough to the agreement now approved, and to such extended agreements, deeds of transfer, and of indemnity and other deeds or instruments as shall be requisite, and as shall be approved by the General Purposes Committee, for carrying into effect the said agreement for sale and purchase."

Alderman BROOKE proposed, and Alderman DENHAM seconded, the following resolution, which was carried:—"That the sum of £140,400 be borrowed under the authority of the said Huddersfield Improvement Act, 1871, for the purpose of carrying out the said purchase of gas-works on such terms as to interest or otherwise, as the Finance Committee shall approve, and that mortgage securities

for such loans be issued and sealed with the corporate common seal of the borough."

Alderman WOODHEAD proposed, and Alderman CROSLAND seconded, the following resolution, which was carried:—"That in the event of any of the shareholders of the gas company being willing to allow their portions of the purchase money to be retained on loan by the corporation, they be allowed such rate of interest thereon as will be equal to the income thereon as represented by the dividends of the gas company in respect thereof."

Councillor H. HIRST proposed, and Councillor HOUGHTON seconded the following resolution, which was carried:—"That, in exercise of the option contained in the agreement with the gas company, the council now elect and determine for the purchase and sale to take effect as on the 1st of January inst., possession being taken on the 1st of March next."

It was also resolved—"That this meeting be adjourned to the first Thursday in February next, for the consideration of the purchase of the gas-works, and that in the meantime the report of the General Purposes Committee be printed and supplied to each member of the council."

AVERAGE COMPOSITION AND QUALITY OF THE METROPOLITAN WATERS, IN DECEMBER, 1871.—The following are the returns of the Metropolitan Association of Medical Officers of Health:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.		Hardness.	
			As Nitrates, &c.	As Ammonia.	Before Boiling.	After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	21·97	0·048	0·124	0·003	16·2	3·8
West Middlesex	20·40	0·028	0·118	0·001	15·4	3·6
Southwark and Vauxhall	20·80	0·050	0·122	0·002	15·5	3·6
Chelsea	21·83	0·049	0·120	0·003	16·0	3·7
Lambeth	21·21	0·051	0·119	0·004	15·8	3·7
Other Companies.						
Kent	26·83	0·011	0·182	0·000	20·0	6·0
New River	20·60	0·028	0·120	0·001	15·6	3·7
East London	22·31	0·056	0·125	0·001	16·7	4·2

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases but the following, when it was more or less turbid—namely, in that of the Grand Junction and the Chelsea companies. The average quantity of water supplied daily to the metropolis during the preceding month was, according to the returns of the water companies to the Association of Medical Officers of Health, 103,055,193 gallons; and the number of houses supplied was 482,711.

HY. LETHEBY, M.B.

AVERAGE COMPOSITION AND QUALITY OF THE METROPOLITAN WATERS IN THE YEAR 1871.—The following are the returns of the Metropolitan Association of Medical Officers of Health:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gal.	Oxygen required by Organic Matter, &c.	Nitrogen.		Hardness.	
			As Nitrates, &c.	As Ammonia.	Before Boiling.	After Boiling.
	Grs.	Grs.	Grs.	Grs.	Deg.	Deg.
Thames Water Cos.						
Grand Junction	19·56	0·102	0·128	0·003	14·8	3·8
West Middlesex	18·71	0·040	0·124	0·001	14·4	3·3
Southwark & Vauxhall	19·44	0·089	0·125	0·003	14 8	3·8
Chelsea	19·48	0·093	0·136	0·003	14·9	3·8
Lambeth	19·79	0·082	0·123	0·003	15·0	3·8
Other Companies.						
Kent	27·60	0 010	0·215	0·000	20·7	5·7
New River	19·19	0·032	0·132	0·001	14·8	3·5
East London	20·39	0·060	0·143	0·001	15·0	4·0

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

It appears, therefore, that the average amount of saline matter dissolved in the water supplied to London during the year has ranged, in the case of the Thames supply, from 18·71 grains per gallon (West Middlesex Company) to 19·76 grains (Lambeth Company); in the New River water it has averaged 19·19 grains; in the River Lea water (East London Company), 20·39 grains; and in the water from the deep chalk wells of the Kent Company it has amounted to 27·6 grains per gallon. The fluctuations of these proportions have not been considerable during the year, although, in all cases, the water has contained more saline matter in winter, during wet weather, than in summer; the maximum being in January and February, and the minimum in September. The hardness of the general supply has been from 14·8 to 15 degrees of Clark's scale, and this has been reduced by boiling for a quarter of an hour to about 4 degrees. In the case of the chalk well water it has been 20·7 degrees, and the permanent hardness 5·7 degrees. As to the proportion of organic matter in the water, it has been very small, for the quantity of oxygen required to act on every description of oxydizable matter has ranged from only 6·010 of a grain per gallon in the chalk water of the Kent Company, to 0·102 of a grain in the Thames water of the Grand Junction Company; and the proportions of ammonia and of organic nitrogen have not exceeded the one-hundredth part of a grain per gallon of water. As regards turbidity, the water of the Chelsea and of the Grand Junction Companies has in each case been more or less turbid on eight occasions, while that of the Lambeth Company has been turbid on five occasions, and that of the Southwark and Vauxhall Company on one occasion. The quantity of water supplied to the metropolis has averaged 106,929,244 gallons daily, and of this 55,695,796 gallons have been derived from the Thames, 44,161,791 from the New River and the river Lea, and 7,071,657 from the chalk wells of the Kent Company. The maximum daily supply (116,799,067 gallons) was in August, and the minimum (100,782,216 gallons) in February. These quantities were supplied to 487,230 houses, and it therefore amounts to an average daily supply of 32·7 gallons per head of the population, or nearly 220 gallons per house. It is very probable that from 80 to 82 per cent. of this supply is used for domestic purposes, and considering that in many well regulated-towns where the supply is constant it does not exceed 20 gallons per head of the population, it is manifest that at present there is considerable waste of water in London from the neglect of domestic fittings. This will, no doubt, be remedied when the Metropolis Water Act, 1871, comes into operation, as it will do on the 21st of February next, and a constant service is supplied; for it will then be the duty of the water companies to see to the proper conditions of the fittings of every house, and to enforce the provisions which will be sanctioned by the Secretary of State. How far the public, who have clamoured for such a supply, will like the interference and expense which it necessarily entails, is very doubtful; for the fittings in use in this metropolis are generally so imperfect, and are situated in such out-of-the-way and inconvenient places, that for the purpose of preventing waste and misuse of water, as the Act of Parliament directs, they must be to a large extent repaired and renovated. The penalties for defective fittings are sharp and decisive; for not only is the defaulter liable to a fine of £5, but the companies have the power to cut off the supply of water, and to report him to the nuisance authorities. In the 32nd section of the Act it is declared that if the provisions of the Act are not complied with as regards fittings, misuse of water, and undue consumption of it, the company supplying the water may, without prejudice to any remedy against the defaulter, cut off the service, and cease to supply water so long as the injury remains or is not remedied; and in every case of so cutting off or ceasing to supply, the company shall within 24 hours thereafter give to the nuisance authority, as defined by the Sanitary Act, 1866, notice thereof; and if the fittings are not repaired within the prescribed time, the house shall be a nuisance within section 11 and sections 12 to 19 inclusive of the Nuisances Removal Act, 1855, and shall be considered as unfit for human habitation. These summary powers are absolutely necessary, not only for the prevention of such waste as might occasion public calamity, but also to guard against destruction of property by overflowing cisterns and the giving way of defective pipes. When, however, all this is brought into proper and harmonious working, as no doubt it will be by due caution and forbearance, the results will be most advantageous, especially to the poorer classes of the community. HY. LETHEBY, M.B., &c.

DR. WHITMORE'S REPORT ON THE QUALITY OF THE WATER SUPPLIED IN ST. MARYLEBONE, IN DECEMBER, 1871:—

DECEMBER, 1871.	Total Solid Matter in degrees or grains per Imperial gallon.		* Loss by Incineration of Solid Matter in previous column.		Ammonia.
	Dec., 1870.	Dec., 1871.	Dec., 1870.	Dec., 1871.	
Distilled Water	0°	0°	0°	0°	0°
West Middlesex water	—	19·88	—	10·4	—
Grand Junction water	—	19·04	—	0·86	—

* The loss by incineration represents the amount of organic and other volatile matters contained in an Imperial gallon (70,000 grains) of water.

DR. WHITMORE'S REPORT ON THE QUALITY OF THE GAS SUPPLIED IN ST MARYLEBONE, IN DECEMBER, 1871:—

DECEMBER, 1871.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quantity of Sulphur in 100 Cub. Ft.	Mean Quantity of Ammonia in 100 Cub. Ft.	Sulphuretted Hydrogen.
	*Mean of 20 Obser.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Imperial Company's gas	16·50	17·23	15·98	25·47	10·80	32·66	0·5	None.
Chartered Company's common gas	16·61	17·44	15·76	33·25	10·81	32·16	0·91	None.
Chartered Company's cannel gas	23·09	23·77	22·57	30·02	15·06	26·64	0·5	None.

Mean of daily readings of barometer . . . . 29·97
" " " thermometer . . . 48·13

* Each observation consists of 10 readings of the photometer, at intervals of one minute

During the month the mean illuminating power of the Imperial gas was equal to the light of 16½ sperm candles; it ranged between 17·23 and 15·98 candles. The mean amount of sulphur contained in 100 cubic feet of this gas was 32·66 grains, and of ammonia half a grain. The mean light of the Chartered Company's common gas was equal to that of 16½ sperm candles; it ranged between 17·44 and 15·76 candles. The mean quantity of sulphur found was 32·16 grains, and of ammonia 9-10ths of a grain. The mean light of the cannel gas was equal to 23 candles; it ranged between 23·77 and 22·57 candles. In this gas the mean amount of sulphur was 26·64 grains, and of ammonia half a grain. On no single occasion did the ordinary tests detect the presence of sulphuretted hydrogen in either of the gases. The pressure of all was generally satisfactory. The above results were obtained from the gas manufactured by the Imperial Company at their Fulham works, and from the Chartered Company's gas, manufactured at their works, Horseferry Road, Westminster.

QUALITY OF THE LONDON GAS.—Dr. Letheby, the chief gas examiner appointed by the Board of Trade, has recently submitted his quarterly report to the Corporation of London and the Metropolitan Board of Works, from which it appears that the following are the maximum, minimum, and average amounts of illuminating power and of grains of sulphur per 100 cubic feet of gas in the case of the different companies:—

NAMES OF COMPANIES.	Illuminating Power in Standard Candles.			Grains of Sulphur per 100 Cubic Feet of Gas.		
	Max.	Min.	Average.	Max.	Min.	Average.
CHARTERED—						
Common Gas, Cannon Street	18·1	15·8	17·01	46·5	26·7	36·90
" " Gray's Inn Road	18·0	15·4	17·15	53·8	21·5	40·30
" " Friendly Place	18·9	16·8	17·80	57·0	10·5	21·08
" " Arundel Street	18·1	16·1	17·05	37·4	31·2	35·90
Cannel Gas " "	26·4	23·0	24·93	32·8	24·4	28·54
IMPERIAL—						
Common Gas, Oakley Square	17·5	15·6	16·43	38·0	28·7	34·06
" " Camden Street	17·0	14·3	15·58	33·1	19·1	27·00
" " Graham Street	18·2	14·8	16·38	31·3	21·5	27·26
SOUTH METROPOLITAN GAS	17·6	14·4	16·33	39·4	29·6	35·23

In the corresponding quarter of last year the average amount of sulphur in the common gas ranged from 19·78 grains per 100 cubic feet to 33·17, and in the case of the cannel gas from 12·27 to 24·39 grains. The proportion of sulphur, therefore, in the gas has been largely increased since last year. Sulphuretted hydrogen has always been absent from the gas of all the companies; and the average amount of ammonia has been only from 0·09 of a grain per 100 cubic feet of gas to 1·22 grains; the proportion permissible in the gas being 2·5 grains per 100 cubic feet.

THE FRAUDS UPON THE BIRMINGHAM GAS COMPANY.—The reward for the arrest of Joseph Harrison, late secretary to the Birmingham Gas Company, has been increased to £200.

BIRMINGHAM WATER-WORKS.—A special general meeting of the shareholders of this company was held on the 3rd inst., at which it was resolved—"That the directors be authorized and requested to raise from time to time, as they may think necessary and proper, any additional sum or sums of money on mortgage, not exceeding in the whole £42,000, as authorized by the Birmingham Water-Works Act, 1866, section 22."

SUPPLY OF GAS TO TAMWORTH.—At the meeting of the Town Council on the 4th inst. the mayor read an answer received from the gas company respecting the purchase of their works, by the board, which stated that sufficient time had not been allowed them to reply to the matter, and asking for further particulars. It was resolved, by six to two, that a copy of the gas company's new bill be procured and published in one of the local papers.

EXPLOSION OF GAS AT RAMSGATE.—On Thursday, the 4th inst., an explosion of gas occurred in King Street. It appears that a smell of gas had been noticed in the house of Mr. Ellis, trunk maker, and a gas-fitter called in to discover the leak. A large quantity had accumulated in the cellar, and on Mr. Ellis and the other entering it with a lighted candle there was a violent explosion. Mr. Ellis was severely cut about the face, and, being somewhat advanced in years, the most serious consequences were apprehended from the shock to his system. The other, named Ledner, received a cut on the head, but was not much hurt.

THE INTERDICT AGAINST THE EDINBURGH WATER TRUSTEES.—On Thursday, the 4th inst., a reclaiming-note was lodged in the First Division of the Court of Session against the recent judgment of Lord Gifford in the interdict against the old Edinburgh and District Water Trustees, at the instance of Mr. Charles Cowan and Mr. Colin Mackenzie. The reclaiming-note bears the names of all the old trustees, with the exception of Baillie Cousin, Convener Robertson, and Councillors Methven, Crighton, and Wilson, as also Messrs. Marwick and Cameron.

KEIGHLEY BOARD OF HEALTH.—An adjourned meeting of this board was held on Tuesday, Jan. 2, Mr. Jonathan Gill presiding. Mr. Hird stated that the Gas Committee recommended the board to oppose the Haworth Gas Bill, on the ground that it asked for powers to supply gas to Oakworth district and Cross Roads, thus encroaching upon the ground which the Keighley Board had powers in their Act of 1869 to supply with gas from their own works. He proposed that the bill be petitioned against, and the motion, which was seconded by Mr. Leach, was carried unanimously.

SUPPLY OF GAS TO BURSLEM.—At the monthly meeting of the local board, on the 3rd inst., the chief bailiff (Mr. W. Woodall) presiding, the gas committee reported an interview with the directors of the gas company, who agreed to erect a sulphur-testing apparatus at the examiner's house, and the committee were willing to accept this as partly meeting the requirements of the town, but without waiving their claim to a complete apparatus for testing, both for purity and illuminating power. The directors also agreed to call in Dr. Letheby, to examine and report upon the gas and its manufacture, and to make suggestions for getting rid of superabundant sulphur.

METROPOLITAN GAS SUPPLY.—At the meeting of the Metropolitan Board of Works, on Friday, Jan. 5, Mr. E. Dresser Rogers called attention to the last report of Dr. Letheby on the quantity of gas supplied to the metropolis, particularly as to the quantity of sulphur impurity. He stated that under the Act of 1860 the maximum amount was fixed at 20 grains per 100 cubic feet, whereas the report of the chief gas examiner owned that under the present Act the quantity ranged from 27 to 40 grains. He moved a resolution, which was agreed to, referring the report to the Works and Gas Committee to make inquiries, and to endeavour to get the gas referees to define the proper amount.

WATER SUPPLY OF BINGLEY.—At the meeting of the Improvement Commissioners, on the 2nd inst., the Water Committee recommended that a new cistern should be put down at the Ruins Spring, in order to collect and preserve the water during the night. The cistern proposed will hold 20,000 gallons, and new pipes will be laid in order to convey the water direct from the cistern into the town, the present reservoir being above the level of the springs. A long discussion took place respecting the necessity of obtaining a better supply of water for domestic purposes. Several suggestions were made, but the matter was ultimately left in the hands of the committee to make arrangements and submit them to the board at an early meeting.

PRESENTATION TO MR. W. H. CHAMBERS, OF LOWESTOFT.—We have much pleasure in announcing that the workmen employed at the Lowestoft Gas-Works presented Mr. Chambers, on Monday, Jan. 8, with a very handsome silver-plated inkstand, in acknowledgment of the kind and considerate regard he has always shown for their welfare. Mr. G. Balls was deputed on behalf of the men to make the presentation, and to express their united wish that Mr. Chambers might be spared for many years to enjoy increased health and happiness. Some of our readers will remember that Mr. Chambers's connexion with the Lowestoft Gas-Works dates back to 1837, when the works were first erected, and some of the *employés* have served under that gentlemen for upwards of 30 years.

WATER SUPPLY OF WAKEFIELD.—At the ordinary monthly meeting of the Town Council on the 3rd inst.—the mayor presiding—a discussion took place with regard to the application about to be made by the Wakefield Water-Works Company to Parliament to raise £56,250 for extending their works, and it was arranged that the Parliamentary Committee should meet to discuss the matter, and then report to a special meeting. It appeared to be the opinion of the speakers that the works should be in the hands of the corporation, and that there should be a better source of supply than the polluted river Calder. Mr. Moorhouse said that no town could have a low death rate whilst it drank filtered sewage; and Alderman Dibb said it would be madness to put up with such a supply as they had at present any longer than they could possibly help.

THE WAKEFIELD WATER-WORKS.—The Wakefield Town Council, on Monday, Jan. 8, by a majority of votes, adopted a memorial to the Board of Trade against the proposed extension of the existing scheme of water-works. It was stated that the company got their supply of water from the Calder at a point two miles below the town of Wakefield; that at the time the company got their Act the river was comparatively pure, but it was now bad in quality, impure, and dangerous to health in consequence of being made the receptacle for the waste water of various manufactories and the sewage of towns on its banks. The water was usually in such a condition as to merit the description given it by the Rivers Pollution Commissions as putrid and stinking. In the opinion of the memorialists it would be exceedingly injudicious to expend any more money on the present scheme.

SUPPLY OF WATER TO GLASGOW.—At the meeting of the Water Committee, on the 1st inst., there was read a report submitted to the Works Committee by Mr. Gale, engineer, stating that the existing mains, which are capable of bringing into the city 28 million gallons of water a day, now barely suffice to supply the inhabitants, and recommending that two new mains, one for the high and the other for the low district, should be led from Meydock Reservoir to Canniesburn. The General Committee approved of this report, the new mains being estimated to cost £50,000. A letter was read from Provost Hunter, of Patrick, proposing that the operation of the differential water-rate between the city and suburbs should be limited to a period of ten years. The committee agreed to propose to the surburban authorities that the differential rate should be limited to 15 years. This was all the business.

DESTRUCTION OF A GASHOLDER AT NORTHAMPTON.—During the night of Thursday, the 4th inst., one of the large gasholders at these works was totally destroyed by the wind, and upwards of £2000 worth of damage done. The wind was blowing a terrific gale and caught the gasholder, and caused the holder to tilt on one side, when the cast-iron columns, which are two feet six inches in diameter, broke off, and one of the falling columns fell upon the top of the holder and made a large hole through which the gas escaped, and the holder as soon as empty fell into the tank one mass of fragment. A gas-lamp which was burning near, and used to light the yard, fortunately went out, and thus prevented what might have been a very serious calamity. The only person in the yard at the time was a watchman, but happily he was some distance off, and escaped without injury. The loss will be a serious one to the shareholders, but their customers will not suffer, as they have several other holders in reserve.

BURSTING OF A WATER-MAIN AT BRISTOL.—On Sunday night, Dec. 31 last, a policeman, going his usual rounds, discovered that one of the main-pipes belonging to the water company had burst opposite Leigh View, Coronation Road, and that an immense volume of water was flowing therefrom. The water company's officer was soon made aware of the occurrence, and the water was turned off at Bedminster Bridge as soon as possible, but not before a large amount of damage had been done. The pipe burst close by the Avon intercepting sewer now in course of construction, and which was quickly filled, the water forcing away between 5000 and 6000 bricks, which were being used in connexion with the works. A great portion of the roadway was also damaged to a considerable extent, and so great and rapid was the flow of water that at one time the inhabitants living near became alarmed, fearing the destruction of their dwellings, and it was only the timely turning off of the water that prevented a more serious affair than has already happened. A wall, however, in front of some of the houses was greatly damaged, if not rendered completely useless.

EXPLOSION OF GAS AT DUNDEE.—About three o'clock in the morning of the 1st inst. a gas explosion took place at Verdant Mill, in Henderson's West Wynd. Taking advantage of the holidays, it was resolved to clean out the mill boilers, and to execute the work several men came to the mill and began operations at a very early hour. They had not long begun when a violent explosion took place. Two of the men who were in front of the boilers were thrown several feet from the place where they were working, but fortunately they sustained no serious injuries. An examination of the mill court and the street adjoining was made, when it was found that considerable damage had been done. Several portions of the mill court were blown up, and also about 45 yards of the street pavement. Some of the stones in the court were of very large size, and seemed to have been thrown up with great force. Gas appears to have been escaping from some pipe near the spot, and to have accumulated in what was originally the scouring-burn, which is now covered up. After the accident, information was communicated to Mr. Macrae, the gas manager, who immediately despatched a number of workmen, under Mr. Cooper, to the spot to search for the gas leak, and to put the street into some state of order. Mr. Macrae was also promptly on the spot, and gave the necessary instructions.

EXPLOSION OF GAS AT BRISTOL.—On Monday, the 1st inst., an explosion of gas occurred at the Preventive Home for Young Girls, which is situated opposite the Children's Hospital, in the Fort Road. It was found that the explosion had taken place in the dining-room of the institution, where its effects had been very severe. The doors and windows of the room were blown completely out, as with the force of gunpowder, and one of the window shutters was hurled a considerable distance to the end of the garden. The ceiling was almost wholly destroyed. Above this room was a dormitory containing ten beds, and the flooring of this apartment was torn up for some distance. Happily no serious accident occurred to any of the inmates of the home. Three children who, being unwell, happened to be in bed at the time, were terribly frightened, but very slightly hurt. A little girl who was lighting a fire in the dining-room had her hair singed by the ignited gas. Had not assistance been at hand there is little doubt that the house would soon have been in flames, for the gas-pipes in the dining-room having been torn open by the force of the explosion, a large body of flame immediately issued from them. It fortunately happened that police constables were near at the moment, and hearing the report hastened to the spot, and with the aid of some of the neighbours they succeeded in extinguishing the flames before much damage was done.

FORFAR GAS COMMISSION.—At the monthly meeting of this board, on Wednesday, January 3, two shares, amounting to £8 annuity, were offered for sale to the commission at 22½ years purchase, in terms of the Forfar Gas Act. The provost said they had the power to buy these shares, but they were not compelled to do so. It was for the meeting to consider whether the parties would obtain 22½ years purchase price in the market were the corporation to refuse them. He had been considering the matter, and thought that, in view of the low rate of interest, and the fact that there were many parties with large sums of money which they were anxious to invest, this price would be got. Mr. Laird thought, as the corporation had been at considerable outlay in carrying out the business, and had immediately before them further outlay, they should not accept of the offers just now. The annuities would come into the market every now and again, and they would have abundant opportunity of buying shares. After some discussion, during which Mr. Laird pointed out the advantage of the 22½ years purchase clause, it was agreed, seeing that the value of the shares was very small, not to take the shares in the meantime. The provost said it was satisfactory to know that the community had taken advantage of the discount offered on accounts paid within 28 days, and that in consequence the quarter's collection had been already completed, a circumstance which had never occurred in the history of the gas company.

FATAL EXPLOSION OF GAS AT LIVERPOOL.—On Tuesday, the 9th inst., Mr. Aspinall, the borough coroner, held an inquest on the body of Andrew Wilson, aged 54, a joiner, who was employed by the Dock Board, and resided in Rutter Street, Toxteth Park. The deceased had been in the employ of the Dock Board for the past 30 years, and on Wednesday, the 3rd inst., was engaged at the hydraulic crane, Coburg Dock. It appears that in the course of the afternoon of Wednesday a gas inspector named J. Grisenthwaite, in the employ of the Liverpool Gas Company, attended at the crane for the purpose of taking the state of the gas-meter, which is situated almost under the crane. He was accompanied by the deceased, whose duty it was to make a record of the index of the meter at the same time that it was examined by the inspector. One of the iron plates which cover the entrance to the subterranean passage in which the meter was placed having been removed, both the men descended, and they had scarcely reached the bottom when they were almost overcome with the impurity of the air. The entrance was left uncovered for a short time, when Wilson, probably thinking that the gas had all escaped into the open air, struck a match to take the register of the meter. In a moment there was a fearful explosion. The remaining iron plate of the covering was blown off, several persons who were standing round the aperture had a narrow escape, and the gas inspector and Wilson were seriously burned and otherwise injured. James Ronald, an engineer on board a vessel then lying in the dock, went into the well, where he found the deceased insensible, with a portion of the iron covering of the well lying upon his body. He was taken to the Southern Hospital, where he died on Friday. The jury found that the deceased had died from an explosion of gas, and presented that as to the nature of the gas or the precise cause of the explosion there was not sufficient evidence to act upon. They highly commended Ronald for his conduct in recovering the deceased from the bottom of the well. The coroner, in addition to the usual allowance to witnesses, gave Ronald 5s., and from the poor-box he gave the widow of the deceased a guinea.

FATAL FIRE AT THE BIRMINGHAM GAS-WORKS.—On Monday, the 8th inst. a fire was discovered at the works of this company in Lord Street. Upon investigation it was formed that a huge stack of coke, about 70 or 80 yards in length, and over 10 feet high, built up against a wall running at right angles to

the canal, was burning near one end. A passage was cleared through the stack, in order that water might be directed between the pieces of coke and at the back of the fire. The fire-engine having been got to work, water was poured also upon the top of the stack. The firemen were unremitting in their exertions until nearly midnight, when the fire was extinguished. Their success, however, was not achieved without a shocking accident. Soon after ten o'clock part of the wall previously alluded to, weakened by the heat, and shaken by successive explosions of gas evolved by the action of fire and water, gave way, and fell towards the lane at the back of the yard. A boy named Watkins, who was standing in the lane, warming himself against the wall, was buried in the *débris*, and was discovered shortly afterwards dead and horribly mutilated. When the wall fell, a fireman named Richard Nightengale was upon a ladder leaning against it, and he received severe injuries necessitating his removal to the General Hospital. During the evening, Samuel Underwood, another fireman, was so overcome with the fumes of the coke that he had to be taken home in a cab. In the course of half an hour, however, he revived. The fire was first observed on Saturday, when it was of small dimensions, and efforts were made to smother it with earth. An inquest on the body of the unfortunate lad Watkins was held by Dr. Birt on Wednesday last. Thomas Edwards, foreman of the Amalgamated Brigade, who assisted to put out the fire, stated that close to the stack of burning coke, and abutting upon the street, there was a wall about 12 feet in height and 1 foot in thickness. Whilst witness was holding the hose for the purpose of throwing water upon the fire, the wall fell over into the road, and immediately afterwards he heard screams. Thinking that some person had been buried under the *débris*, he called several men to his assistance, and on removing a quantity of the bricks and mortar they ultimately succeeded in getting out a boy, who appeared to have sustained rather serious injury. The boy was taken home, and shortly afterwards, on removing more of the bricks and mortar, they found the deceased, who was then quite dead. His right ankle and one of the thighs were broken, in addition to other severe injuries. The jury resumed a verdict to the effect that the deceased had been accidentally killed.

SUPPLY OF GAS TO LINCOLN.—At the monthly meeting of the local board, on the 2nd inst.—the mayor presiding—Mr. Maltby referred to the defective lighting of the public lamps, which he and other members had been appointed to inquire into. He said he had made several tests in various parts of the city, the results of which he gave in detail, and it was found that in consequence of the insufficient pressure, the average consumption of each burner was about 3½ feet per hour, instead of 4 feet, the town thus losing about £80 in six months. He recommended that the gas company should allow them to attach meters to twelve lamps in different parts of the city, the average consumption to be charged accordingly. Alderman Brogden said that Mr. J. Maltby deserved the thanks of the public in taking the matter up, for he was quite right in saying that the lamps were not what they ought to be. But he found fault with him in saying that the gas company did not find sufficient gas, as he had the authority of the engineer to state that pressure to the fullest possible extent was given. About eight years ago the Lighting and Paving Commissioners entered into a contract with the gas company for the supply of gas at 3s. 9d. per 1000 feet, the contract to be terminated by giving six months' notice. Some time afterwards the company reduced the charge to private consumers to 3s. 4d., and he recollected saying at that time that although they were under a contract with the board for the supply of gas at 3s. 9d., it would not be fair if they did not give a public body the same benefit as a private consumer, and the charge was reduced accordingly. The company had acted in the most honourable manner, and if the board were not satisfied, let six months notice of a wish to terminate the contract be given. Moreover, he disputed Mr. Maltby's figures, as the engineer informed him he knew nothing whatever about the power of tests. He submitted that fully 4 feet of gas per hour were supplied to the public lamps, and it was the fault of the persons who were employed by the board to clean and light the lamps if they were defective. With respect to Mr. Maltby's recommendation, it had been tried some years ago, and it was found that the meters were very uncertain, as in some parts of the town the burners consumed 2½, and in others 7 feet per hour. However, it was for the board to say that the gas had not been supplied, and if they did not choose to pay the bill, the matter could be decided in the county court. The subject then dropped. A local paper says, "We understand that the large gasometer recently erected by the gas company upon their premises on the Carholme Road will soon be ready for use, the leak which lately caused so much anxiety and trouble having been discovered and stopped. It is to be hoped that the numerous complaints as to the deficiency of gas will soon cease, as the company will be enabled to store double the quantity of gas for the use of the town."

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

3496.—WILLIAM TEMPLE, of the borough and co. of Newcastle-upon-Tyne builder, for "*Improvements in stench-traps.*" Dec. 27, 1871.

3503.—WILLIAM EDWARD NEWTON, of 66, Chancery Lane, in the co. of Middlesex, civil engineer, for "*Improvements in apparatus for generating gas.*" A communication. Dec. 28, 1871.

3504.—WILLIAM DENNY RUCK, of Greenwich, in the co. of Kent, for "*Improvements in the manufacture of gas.*" Dec. 28, 1871.

3515.—HENRY YOUNG DARRACOTT SCOTT, of Ealing, in the co. of Middlesex, major-general, C.B., for "*Improvements in the treatment of sewage water.*" Dec. 29, 1871.

3517.—JOHANNES AVETICIAN CALANTARIENTS, of Scarborough, in the co. of York, for "*Improved arrangements for preventing pipes or vessels containing water or liquid from bursting by the effects of frost, or similar force suddenly brought into operation.*" Dec. 29, 1871.

27.—JOSIAH LATIMER CLARK, of 5, Westminster Chambers, Victoria Street, in the city of Westminster, for "*Improvements in drain-traps.*" Jan. 4, 1872.

31.—WILLIAM ALEXANDER LITTLE, of the Grove, Hammersmith, in the co. of Middlesex, engineer, for "*Improvements in the preparation and laying down of bituminous asphalte for pavement.*" Jan. 4, 1872.

38.—HENRY YOUNG DARRACOTT SCOTT, of Ealing, in the co. of Middlesex, major-general, C.B., for "*Improvements in the purification of coal gas.*" Jan. 4, 1872.

63.—JOHN FOTHERGILL, of Carshalton, in the co. of Surrey, gentleman, for "*Improvements in fire-irons, whereby gas can be applied to the kindling of fires.*" Jan. 8, 1872.

84.—BRISTOW HUNT, of 1, Serle Street, Lincoln's Inn, in the co. of Middlesex, gentleman, for "*Improvements in meters for measuring water or other fluids.*" A communication. Jan. 10, 1872.

87.—JAMES GOWANS, of Edinburgh, in the co. of Mid Lothian, N.B., for "*An improved cesspool for preventing the escape of sewer gases into houses or other buildings.*" Jan. 11, 1872.

89.—BASIL RONALD, brassfounder, and JOHN FARMER, engineer, both of the city of Glasgow, in the co. of Lanark, N.B., for "*Improvements in water-closets and their valves, which are applicable to other purposes.*" Jan. 11, 1872.

96.—ARNOLD BUDENBERG, of the firm of Schäffer and Budenberg, of the city of Manchester, for "*Improvements in liquid-meters.*" A communication. Jan. 11, 1872.

GRANTS OF PROVISIONAL PROTECTION.

3023.—PETER GENT, of New Brighton, in the co. of Chester, for "*An improved portable gas-oven for culinary purposes.*" Nov. 10, 1871.

3081.—JOHN CLARKSON, of Glasgow, in the co. of Lanark, N.B., engineer, for "*Improvements in steam pumps and engines.*" Nov. 15, 1871.

3297.—THOMAS CHARLES EDDY, F.R.I., B.A., of the city of Durham, architect, for "*Improvements in stoves for warming, ventilating, and disinfecting buildings heated by gas, coke, mineral oils, or other fuels.*" Dec. 7, 1871.

3335.—JOHN SOMERVILLE, gas engineer, and JOHN ROBINSON, mechanic, both of the gas-works, in the city of Dublin, for "*Improvements in machinery or apparatus for charging, discharging, and scurfing retorts and furnaces.*" Dec. 9, 1871.

3348.—GEORGE EVELEIGH, of 16, Asylum Road, Peckham, consulting chemist, for "*An improved means of purifying gas from ammonia.*" Dec. 11, 1871.

3383.—GEORGE HENRY ELLIS, of 20, High Holborn, in the co. of Middlesex, engineer, for "*Improvements in asphalte roads, ways, and floors.*" Dec. 14, 1871.

3388.—WILLIAM HENRY TAYLER, of Tudor House, Anerley, in the co. of Surrey, doctor of medicine, for "*Improvements in the construction of drains, traps, and closets.*" Dec. 14, 1871.

3391.—ALFRED MINTON, of the Victoria Iron-Works, Hackney Wick, in the co. of Middlesex, for "*Improvements in water-closets.*" Dec. 14, 1871.

3396.—CHARLES WEIGHTMAN HARRISON, of South Kensington, in the co. of Middlesex, gentleman, for "*Improvements in gas-burners.*" Dec. 14, 1871.

3398.—JOHN PENDER, of Arlington Street, in the co. of Middlesex, esquire, and MARTIN RAE, of Uphall, in the co. of Linlithgow, N.B., for "*Improvements in the manufacture of artificial asphalte.*" Dec. 15, 1871.

3410.—JOSEPH WHITEHEAD and WILLIAM FOSTER, both of Blackburn, in the co. of Lancaster, for "*Improved hydraulic mains used in the manufacture of coal gas.*" Dec. 16, 1871.

3416.—ALEXANDER MELVILLE CLARK, of 53, Chancery Lane, in the co. of Middlesex, patent agent, for "*Improved apparatus for generating and purifying gases for lighting and heating purposes.*" A communication. Dec. 16, 1871.

3432.—FREDERICK HURD, of the Albion Foundry, Wakefield, in the co. of York, engineer, for "*Improvements in the construction of main-pipes for air, gas, water, and other purposes, and in the pavement of streets and roads.*" Dec. 19, 1871.

3436.—JAMES ALFRED WANKLYN, of Harrington Street, Hampstead Road, in the co. of Middlesex, chemist, for "*Improvements in the manufacture of ammonia salts.*" Dec. 19, 1871.

3447.—ALEXANDER MELVILLE CLARK, of 53, Chancery Lane, in the co. of Middlesex, patent agent, for "*Improved apparatus for the production of gas for lighting and heating purposes.*" A communication. Dec. 20, 1871.

3449.—JAMES EGLINTON ANDERSON GWYNNE, of Essex Street Works, Strand, in the co. of Middlesex, civil engineer, and BENJAMIN BEALE, of Elizabeth Cottage, Parnel Street, New Cross, Deptford, in the co. of Kent, mechanical engineer, for "*Improvements in the construction of rotary engines, which said improvements are applicable for lifting, forcing, and exhausting.*" Dec. 20, 1871.

3455.—WILLIAM ANDERSON, of Inverkeithing, in the co. of Fife, N.B., for "*Improvements in domestic apparatus for rendering sewage gases innocuous.*" Dec. 21, 1871.

3458.—STEWART PETERS and JOHN PETERS, of Glasgow, in the co. of Lanark, N.B., coppersmiths and tin-plate workers, for "*Improvements in economic water-supply apparatus for water-closets.*" Dec. 21, 1871.

3460.—WILLIAM PAWSON, of Westgate, Grantham, in the co. of Lincoln, plumber, for "*Improvements in water-closets.*" Dec. 21, 1871.

3483.—DAVID HUNTER BRANDON, of 13, Rue Gaillon, Paris, France, engineer, for "*Improvements in the construction of water-meters and motors or engines.*" A communication. Dec. 23, 1871.

3487.—GEORGE WIGHTMAN, of Elkesley, near Retford, in the co. of Nottingham, engineer, for "*Improvements in pumps and hydraulic, steam, and other engines.*" Dec. 23, 1871.

3496.—WILLIAM TEMPLE, of the borough and co. of Newcastle-upon-Tyne, builder, for "*Improvements in stench-traps.*" Dec. 27, 1871.

3503.—WILLIAM EDWARD NEWTON, of 66, Chancery Lane, in the co. of Middlesex, civil engineer, for "*Improvements in apparatus for generating gas.*" A communication. Dec. 28, 1871.

3504.—WILLIAM DENNY RUCK, of Greenwich, in the co. of Kent, for "*Improvements in the manufacture of gas.*" Dec. 28, 1871.

3515.—HENRY YOUNG DARRACOTT SCOTT, of Ealing, in the co. of Middlesex, major-general, C.B., for "*Improvements in the treatment of sewage water.*" Dec. 29, 1871.

3517.—JOHANNES AVETICIAN CALANTARIENTS, of Scarborough, in the co. of York, for "*Improved arrangements for preventing pipes or vessels containing water or liquid from bursting by the effects of frost, or similar force suddenly brought into opreration.*" Dec. 29, 1871.

NOTICES TO PROCEED.

2245.—JAMES AMOS, of Ashford, in the co. of Kent, miller, for "*Improvements in ventilation, and in the apparatus or means employed therein.*" Aug. 26, 1871.

2254.—GEORGE HASELTINE, of the firm of Haseltine, Lake, and Co., of Southampton Buildings, London, patent agents, for "*An improved method of and apparatus for utilizing the explosive force of gas as a motive power.*" A communication. Aug. 28, 1871.

2401.—WILLIAM HENRY BARLOW, of 2, Old Palace Yard, in the city of Westminster, for "*Improvements in pumps, water-meters, and engines for obtaining motive power.*" Sept. 12, 1871.

2593.—THOMAS WALLER, of 47, Fish Street Hill, in the City of London, engineer, for "*Improved arrangements for the supply of fresh hot or cold air, or mixed hot and cold air, in infirmaries, hospitals, and other buildings.*" Oct. 2, 1871.

3015.—JOSEPH ELLICOTT HOLMES, of Buckingham Street, Strand, in the co. of Middlesex, civil and mechanical engineer, for "*An improved asphalte compound and apparatus employed in the manufacture of the same, chiefly designed for paving streets.*" Nov. 8, 1871.

3263.—WILLIAM MANN, of the gas-works, Dorset Street, in the City of London, engineer, for "*Improvements in the method of purifying gas, and in the apparatus employed for that purpose.*" Dec. 2, 1871.

3335.—JOHN SOMERVILLE, gas engineer, and JOHN ROBINSON, mechanic, both of the gas-works, in the city of Dublin, for "*Improvements in machinery or apparatus for charging, discharging, and scurfing retorts and furnaces.*" Dec. 9, 1871.

3398.—JOHN PENDER, of Arlington Street, in the co. of Middlesex, esquire, and MARTIN RAE, of Uphall, in the co. of Linlithgow, N.B., for "*Improvements in the manufacture of artificial asphalte.*" Dec. 15, 1871.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

2883.—ALEXANDER ANGUS CROLL, "*Improvements in the preparation of materials to be used in the purification of gas for illumination.*" Nov. 18, 1864.

3059.—EDWARD MYERS, "*Improvements in wet gas-meters.*" Dec. 8, 1864.

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1 in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle and Middlesboro'.	Wales.	Yorkshire, Derbyshire, and Staffordshire
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Pig Iron, No. 1 (g.m.b.)	4 15 0	3 15 6	3 6 6	4 5 0	4 0 0
1¼ and 2-inch Socket-pipes	7 12 6	6 12 6	6 10 0	6 17 6	7 2 6
2½ and 3-inch ditto	6 17 6	5 17 6	5 10 0	5 17 6	6 2 6
4 and 5-inch ditto	6 12 6	5 12 6	5 7 6	5 15 0	6 0 0
6 inches and upwards ditto	6 7 6	5 7 6	5 2 6	5 10 0	5 17 6
Retorts, 1st fusion, hot blast	6 2 6	5 2 6	4 17 6	5 12 6	6 2 6
Ditto, 2nd ditto, cold ditto	7 2 6	6 2 6	5 17 6	6 12 6	7 2 6
Tank-plates, ¼ thick and above	6 12 6	5 12 6	5 7 6	6 2 6	6 12 6

WROUGHT-IRON TUBING,

Subject to 60 per cent. Discount.

	2 in.	1¼ in.	1½ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 14 feet—per foot	1 9	1 2	0 11	0 8	0 6	0 4½
Ditto ditto, from 12 in. to 23½ in.—each	3 0	2 0	1 8	1 4	1 0	0 9
Long Screws, from 12 in. upwards	4 0	2 6	2 0	1 6	1 2	0 11
Bends and Springs	4 3	2 3	1 9	1 3	0 11	0 8
Square Elbows, equal or reducing; Round Elbows, 5 per cent. extra	3 6	2 3	1 9	1 2	0 10	0 8
Tees, wrought or cast	3 9	2 6	1 9	1 3	1 0	0 9
Crosses, ditto, equal or reducing	5 3	3 6	3 0	2 3	1 9	1 3
Iron Cocks	18 0	11 0	9 6	6 6	4 6	3 6
Ditto, with brass plug	32 0	19 6	13 0	10 6	7 6	5 6
Diminishing Sockets, Caps, Plugs, and Nipples	1 3	0 11	0 9	0 7	0 6	0 5
Plain Sockets	1 0	0 7	0 6	0 4	0 3½	0 3
Syphons, 2-quart	23 0	19 0	18 0	17 0	16 0	—

GAS COALS.

Scotch Cannel, f.o.b.:—	Per Ton.
Boghead—at Bo'ness, 63s. 0d.; at Leith	63s. 6d
Muirkirk	27 6
Kirkness, best (at Burntisland)	22 6
Capeldrae, 1st quality (at ditto)	22 6
Ditto, 2nd ditto (at ditto)	17 6
Cowdenbeath (at ditto)	12 0
Lochgelly (at ditto)	12 0
Donaldristie—at Burntisland, 12s.; at Aberdour	12 6
Auchinheath Lesmahago (at Granton)	27 0
Duke of Hamilton's Lesmahago (at Granton)	28 6

Scotch Cannel, f.o.b.:—	Per Ton.
Arniston (at Leith)	26s. 0d
Wemyss (at Wemyss)	20 0
Haywood Co.'s Haywood (at Granton)	23 0
Pirnie, or Methill	17 0
Lothian's Cannel (at Leith)	24 0
Grange ditto (at Bridgeness)	17 6
Kinniel ditto, at Bo'ness)	17 6
Myles' ditto	23 6
Lochore Parrot (at Burntisland)	27 6
Waverley Seam (at do.)	19 0
Lanemark (at Glasgow)	16 0
Elphinstone Tower (at Leith)	20 0

Newcastle—Unscreened:—	Per Ton.
Haswells, Nettlesworth Primrose, and South Pelaw	6s. 6d.
Felling, Framwell Gate, North Pelton, Redheugh Main, Walker's Primrose, West Wear, and Whitwell Primrose	7 6
Burnhope, Craghead, Chariaw, Derwent, East Castle, Edmondsley, Eighton Moor, Hartlepool Pelaw, Holmside, Lambton's Gas, Lanchester Pelaw, Medomsley, Mickley, New Pelaw, Pelaw Main, Ravensworth, Seaham, South Moor Pelton, South Leverson, Townley Main, Tyne Main, West Pelaw, Wearmouth Hutton, and Witton	7 0
Pearetb, Ravensworth Pelaw, Waldridge, West Garesfield, and West Pelton	7 3
Brancepeth, Dean's Primrose, Londonderry Gas, New Pelton, Pelton, South Pearetb, Stella, Urpeth, Washington Hutton, and West Leverson	7 6
Ramsay's Newcastle Cannel	17 6
Wigan Cannel (at Liverpool)	17 6

FREIGHTS.

Coastwise—Newcastle:—	Per Ton.
Chatham and Rochester	6s. 9d
Cork	8 6
Dover, Folkestone, & Ramsgate	8s. 0d. to 8 6
Dublin	8 6
Exeter Quay	9 0
Ipswich	6 9
London (from Leith)	—
London (Pool)	7s. 6d. to 8 0
Lowestoft and Yarmouth	6 0
Portsmouth & Southampton	10 0
Plymouth	10 6
Shoreham	8 0
Whitstable	8 6
Weymouth	8 9

Foreign:—	Per Keel.
Barcelona	£30 to £30 10s
Bordeaux	10 0
Boulogne and Calais	8 11
Cadiz	13 0
Cronstadt	—
Copenhagen	—
Genoa	19 0
Hamburg	11 0
Havre de Grace	—
Leghorn	19 0
Lisbon	10 10
Rotterdam	—
Stettin	—
Trieste	29 0
Venice	31 10

TURNER & ALLEN,

201, UPPER THAMES STREET,

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GAS & WATER ENGINEERS.

CONTRACTORS FOR THE SUPPLY OF

LAMP COLUMNS, LANTERNS, FOUNTAINS, PIPES, &c.,

TO

GAS, WATER, & RAILWAY COMPANIES, LOCAL BOARDS, SHIPPERS, &c.

Complete Pattern and Price Book, 3s. 6d. post free.

DUKE OF HAMILTON'S
LESMAHAGOW GAS COAL.

LESSEES:

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Office—5, DIXON STREET, GLASGOW.

Works—BLACKWOOD & SOUTHFIELD, LESMAHAGOW.

English and Foreign Agents:

JAMES MILLER, SON, & Co.,

1, GREAT ST. HELEN'S. LONDON, E.C.,

AND

75, UNION STREET, GLASGOW.

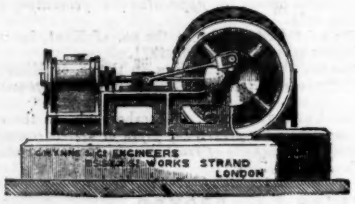


FIG. 213.

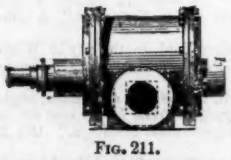


FIG. 211.

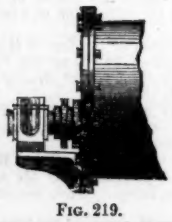


FIG. 219.

GWYNNE & COMPANY,

HYDRAULIC, MECHANICAL, & GAS ENGINEERS,

ESSEX STREET WORKS, STRAND,

London, W.C.,

SOLE MANUFACTURERS OF

BEALE'S IMPROVED PATENT GAS-EXHAUSTER,

Under the personal superintendence of **Mr. BEALE.**

REDUCED PRICES AND INCREASED CAPACITY.

Also manufacturers of Improved Hydraulic Regulators, to actuate a steam or gas throttle-valve to suit the make of gas; self-acting bye-pass valves, to move by hand or otherwise; improved stop-valves, with faced flanges, forming the neat adjunct to Exhauster of valve and elbow combined. Exhausters manufactured on the new principal have given the utmost satisfaction, and can be seen working at several large Gas-Works in London. G. & Co. are now engaged in manufacturing the **largest Gas-Exhausters in the world, with engines complete.**

The Gas-Exhausters may be made with inside or outside bearing, as shown in Figs. 211 and 219.

Fig. 213 shows the Improved Gas-Exhauster attached to, and driven by one of GWYNNE AND CO.'s well-known high-speed Horizontal Steam-Engines, without any intermediate gearing. This arrangement is extremely compact, and is beautifully adapted for small or large Gas-Works, and the foundations and erection are both very simple and inexpensive.

Prices and every information upon application to GWYNNE AND CO. *as above.*

DUKE OF HAMILTON'S
LESMAHAGOW GAS COAL.

The superior quality of this well-known Cannel, as wrought by

THE NITSHILL AND LESMAHAGOW COAL COMPANY,

Is now generally admitted by all Gas Engineers.

PRICE AND ANALYSIS MAY BE HAD ON APPLICATION TO

JAMES M'KELVIE, HAYMARKET, EDINBURGH.

WANTED, a Leading Stoker, maximum production 60,000 feet in 24 hours. To an experienced energetic stoker a permanent appointment is offered.
Address D. 7, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Hong Kong and China Gas Company, Limited, a RETORT-SETTER who is competent to act as yard foreman.
Apply to C. E. WALDUCK, Secretary, 11, Old Jewry Chambers, LONDON, E.C.

WANTED, a situation as Manager, by an engineer who has had 12 years experience in the erection of Gas-Works. Is practically acquainted with the manufacture and distribution of gas and general maintenance of works. Good testimonials as to character and ability.
Address W. D. CHILD, 319, East India Road, POPLAR.

ROCHESTER, CHATHAM, AND STROOD GASLIGHT COMPANY.

WANTED, a Man thoroughly compe- tent to make and repair Gas-Meters. Wages 35s. per week.
Apply by letter only to WILLIAM SYMS, Secretary and Manager, Gas Office, 56, High Street, ROCHESTER.

WANTED, by a provincial Gas Com- pany, where the annual make is about 22,000,000 cubic feet, a steady and experienced Man as FOREMAN. Must thoroughly understand the manufacture of gas, fittings, &c.
Address, stating age, references, and qualifications, also wages expected, to A. B., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS COMPANIES AND OTHERS.

A Chemist of some experience in the manufacture of PUR MOT is now ready to treat with Gas Companies or others for the manufacture of a new article of very great saturating power, which can be manufactured by the Gas Company on their works, at a comparatively small cost.
For further particulars, apply to BETA, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS COMPANIES.

A Secretary who has reduced consumers charges, improved the standard of gaslight, and increased the dividends, who knows the law and routine of Gas-Works, is a superior accountant, a practical business man, and of good position and character, is open to an APPOINTMENT besides his present (West of England), or to a business large enough to occupy his whole time and energy.
Address C. Z., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

EXETER GAS COMPANY.

A Vacancy having taken place in the office of SECRETARY to the above Company, the Directors are ready to receive APPLICATIONS for the situation, from persons (about 30 years of age) having a thorough knowledge of the business of a Gas Company, and who can furnish unexceptionable references as to character, capacity, and experience.
Applications, stating age and salary required, to be addressed to Directors not later than Tuesday, the 30th inst.
Exeter, Jan. 16, 1872.

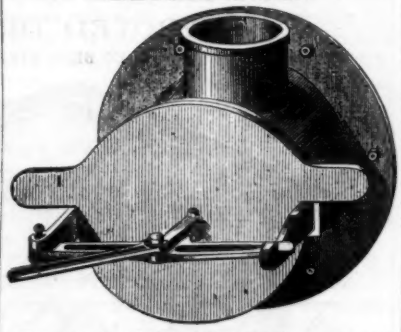
WANTED, in a Gas-Meter Manufactory, an active person, who thoroughly understands the trade, with a view to Partnership.
Address, Mr. FENTON, 1, Commercial Street, LEEDS.

GAS TAR.

OFFERS Wanted for about 3000 gallons of TAR, in paraffin casks, on the Great Western Railway at Witney Station. Casks may be purchased or returned.
Address MANAGER, Gas-Works, Witney, OXON.

THE BEST FIRE BRICKS exported from the Tyne are branded ROBSON.
Apply to W. C. GIBSON, 43, Side, NEWCASTLE-ON-TYNE.

BOX'S PATENT FASTENING FOR RETORT-LIDS.



The above description of Fastening has been in successful use for a considerable time, and can be supplied at a much more economical rate than the ordinary cross-bar and screw.
For prices and particulars, apply to W. BOX, Gas-Works, Crayford, KENT.

CLOTH GAS-BAGS for MAINS, as supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber and Gutta-Percha Machine-Bands, Sheet and Washers for Steam Joints.
T. BUGDEN, Manufacturer, 79, Goswell Road, LONDON, E.C.

TO GAS COMPANIES AND OTHERS.

THE Advertiser is open for an engage- ment as MANAGER. For the past six years has had the management of a work where the make is over 30 millions annually. The highest testimonials given.
Apply to A. D., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS MANAGER WANTED.

THE Georgetown (British Guiana) Gas Company, Limited, require a MANAGER for their Works at Georgetown, who must be well acquainted with all indoor and outdoor work of every description. Salary £400 per annum, paid monthly, with house not exceeding £15 per annum, and taxes on same, fuel, and gas free, with an additional £75 per annum increase in salary for every 1 per cent. paid in dividend to the shareholders over 7 per cent. Free passages out and home, and half salary during said passages. Agreement for one, three, or five years, at option of Company, and engagement to terminate afterwards by six months notice on either side.
Applications, enclosing testimonials (copies only), to be addressed to the Secretary, 6, Westminster Chambers, Victoria Street, London, before Tuesday, Feb. 6, 1872.
By order, GEORGE W. HARRIS, Secretary.

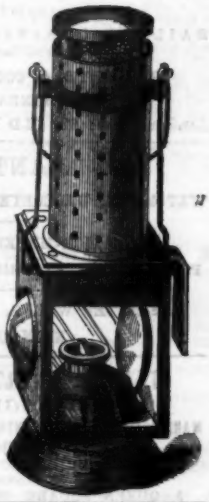
FOR SALE.—Four Purifiers, 10 ft. square, with centre-valve and connexions. Two Purifiers, 12 ft. square. A Beale's Exhauster, to pass 25,000 feet per hour, with governor and bye-pass. A Jones's Exhauster, to pass about 15,000 feet per hour. A Station-Meter, to pass 25,000 feet per hour. Mouthpieces, Hydraulic Main, and other apparatus suitable for Gas-Works.
Apply to the Tynemouth Gas Company, NORTH SHIELDS.

ARMSTRONG'S SAFETY LAMP

FOR GAS-WORKS,

Or for any purpose where a good light and safety are required.

This lamp has been in use in most of the English and Foreign Gas-Works for many years, giving entire satisfaction.



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H. ARMSTRONG,
GAS · METER
MANUFACTURER,
GAS AND HOT WATER
ENGINEER,
43, MANCHESTER STREET,
KING'S CROSS.
Gas-Works for Mansions Erected.

MANUFACTURE AND DISTRIBUTION ACCOUNTS.

Mr. W. J. WARNER

Begs to say that in consequence of the number of inquiries he has received relative to the above form of Accounts, which he had the pleasure of submitting to the
BRITISH ASSOCIATION OF GAS MANAGERS,
AT THEIR LATE MEETING IN DUBLIN,
he has been induced to publish them, and is now prepared to supply the two sheets, post free, for 3s.
Applications to be made to
Mr. W. J. WARNER,
Engineer,
GAS-WORKS, SOUTH SHIELDS.

ALFRED LASS,
ACCOUNTANT,
MERTON ROAD, NEAR HIGH STREET,
WANDSWORTH, S.W.

Mr. Alfred Lass having had considerable experience in arranging, making up, balancing and auditing gas accounts, begs to inform the Directors of Gas Companies that he may be consulted on all matters relating thereto.
Balance-sheets prepared, Accounts audited, Consultations, Agencies, &c.

ALFRED PENNY, Gas and Consulting ENGINEER,
WENLOCK IRON-WORKS,
21, WHARF ROAD, CITY ROAD, LONDON.
Mr. PENNY having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, and T-pieces, &c., &c.
Plans, Specifications, and Estimates prepared.

SAMUEL PONTIFEX, Consulting Gas Engineer, having retired from the Great Central Gas Company, is now prepared to furnish PLANS and SPECIFICATIONS, as well as ADVISE Provincial Gas Companies as to the erection of new, or alteration and enlargement of existing works.
Offices: 22, Coleman Street, LONDON, E.C.

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UNION STREET WEST, OLDHAM,
BRASS FOUNDER AND FINISHER,
MANUFACTURER OF
IMPROVED WET AND DRY CONSUMERS GAS-METERS,
LAMP METERS AND BOXES,
GOVERNORS, GAUGES, INDICATORS, EXHAUST & PRESSURE REGISTERS,
GAS STATION-METERS,
With all the joints planed.
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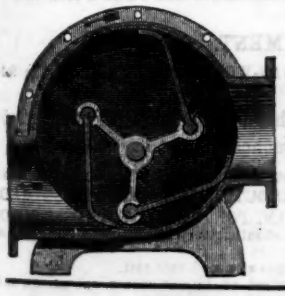

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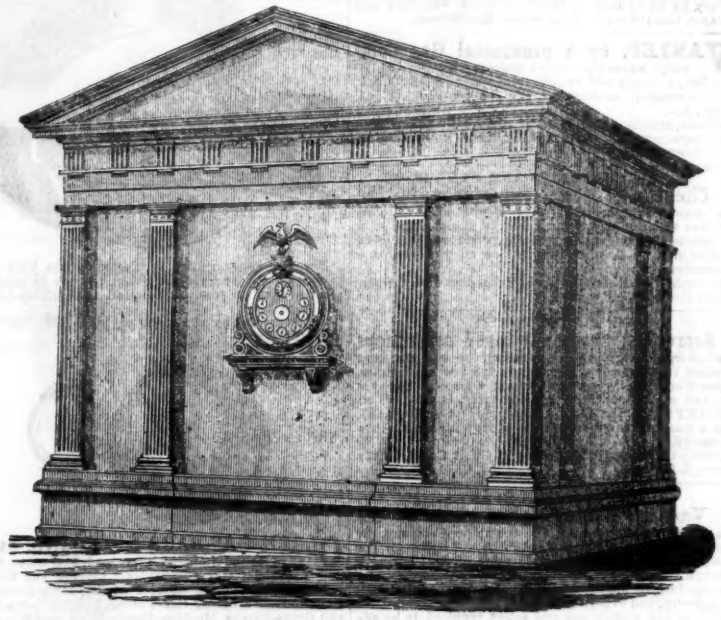

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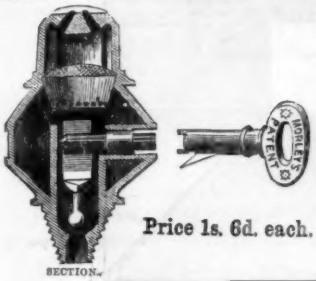

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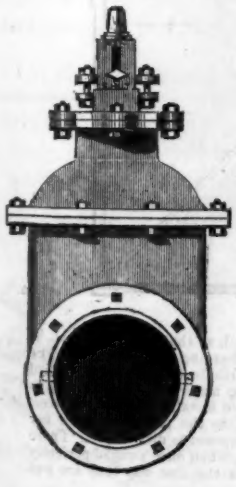

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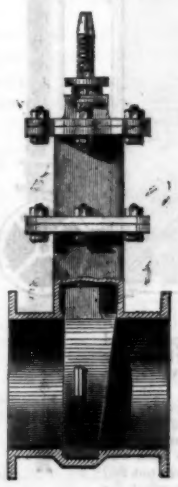

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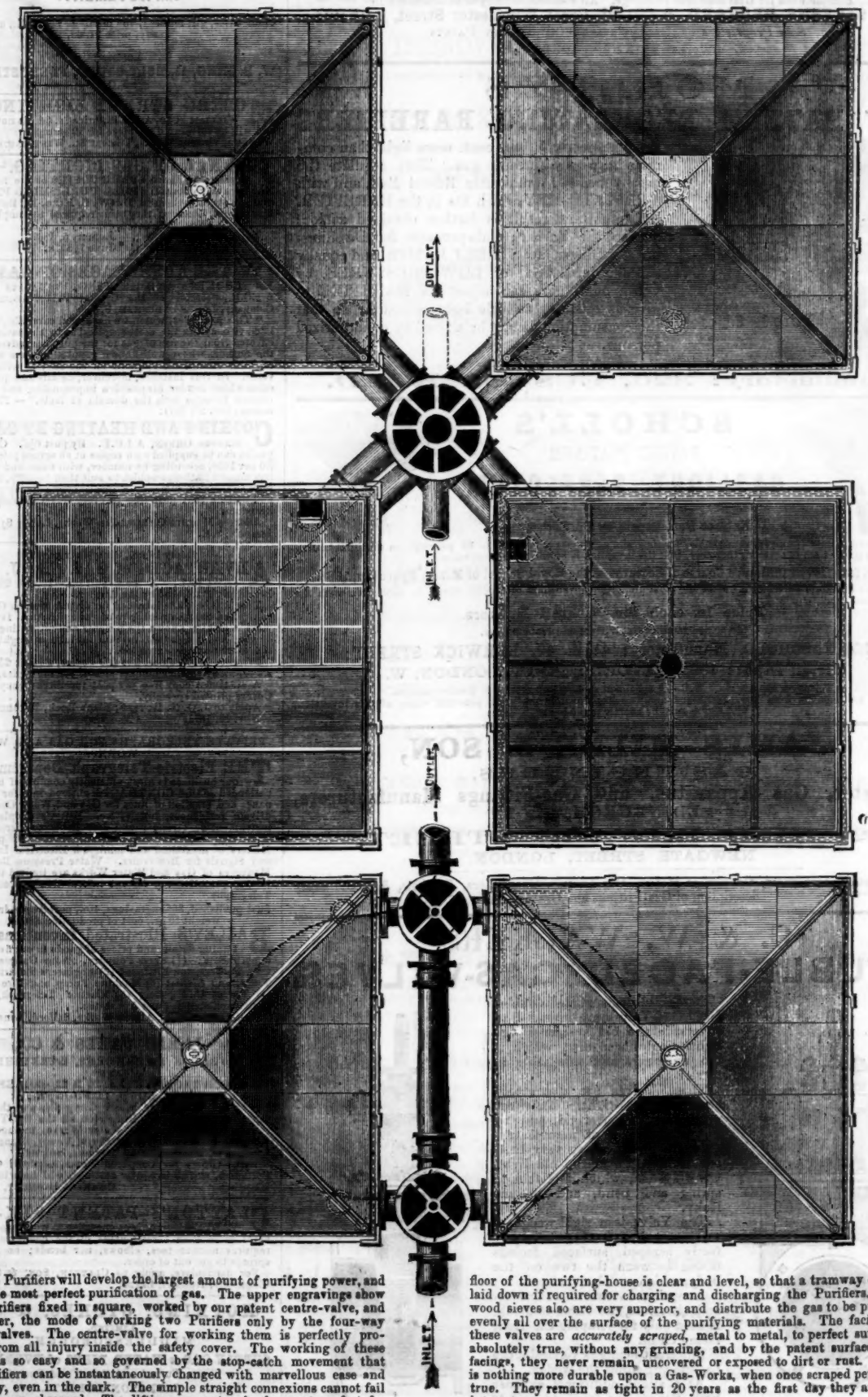

These Purifiers will develop the largest amount of purifying power, and effect the most perfect purification of gas. The upper engravings show four Purifiers fixed in square, worked by our patent centre-valve, and the lower, the mode of working two Purifiers only by the four-way centre-valves. The centre-valve for working them is perfectly protected from all injury inside the safety cover. The working of these valves is so easy and so governed by the stop-catch movement that the Purifiers can be instantaneously changed with marvellous ease and certainty, even in the dark. The simple straight connexions cannot fail to be at once observed. The lifting apparatus is the most perfect for work, and one man can lift and travel a purifier-cover of any size. The floor of the purifying-house is clear and level, so that a tramway can be laid down if required for charging and discharging the Purifiers. The wood sieves also are very superior, and distribute the gas to be purified evenly all over the surface of the purifying materials. The facings to these valves are *accurately scraped*, metal to metal, to perfect surfaces, absolutely true, without any grinding, and by the patent surfaced bar facings, they never remain uncovered or exposed to dirt or rust. There is nothing more durable upon a Gas-Works, when once scraped perfectly true. They remain as tight in 20 years as the first day they are put into use.

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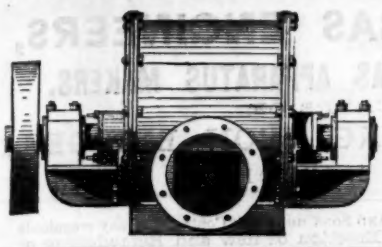

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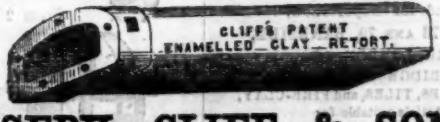

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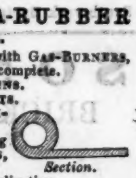

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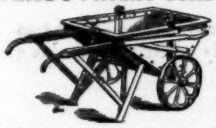

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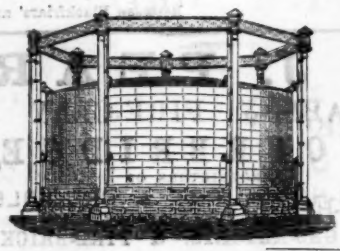

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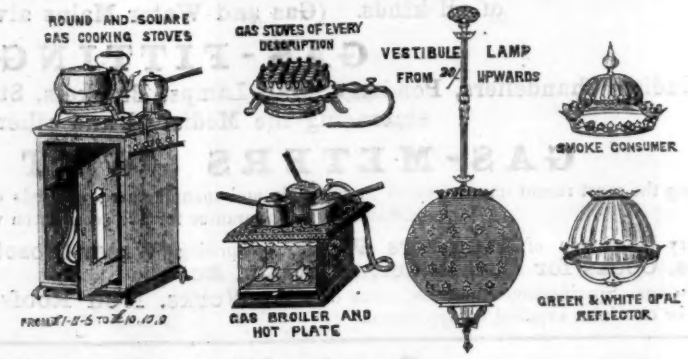
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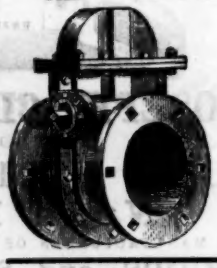

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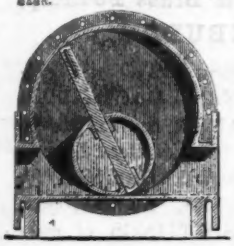

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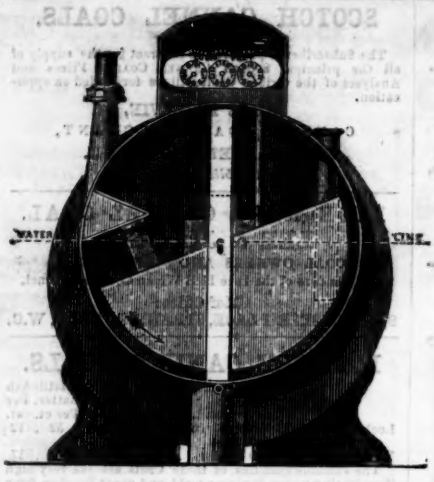

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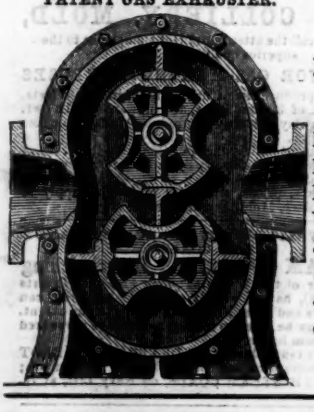

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